The Effects of the Headsprout Early Reading Program on the Literacy Skills and
On-Task Behavior of At-Risk Urban Kindergarten Students

Dissertation

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Abstract

Young children who experience difficulty learning to read are at an increased risk for reading failure and behavior problems. Emerging evidence suggests that improving the literacy skills of young struggling readers also improves levels of on-task behavior. This study examined the effects of Headsprout Early Reading, a phonics-based online reading program, on the reading achievement and levels of on-task behavior of urban kindergarteners with concomitant reading and social behavior deficits. The study included six participants who received the intervention and one participant who did not, but whose performance data were used as a comparison tool to represent ideal achievement (reading and on-task behavior) for a kindergartener in the school in which the study occurred. A multiple probe across behaviors (i.e., Headsprout instructional targets) and participants was utilized. Data were collected on program-specific reading performance, generalized reading performance (e.g., AIMSweb Tests of Early Literacy), and levels of on-task behavior during classroom reading instruction. In general, the results of the study demonstrate that the Headsprout Early Reading program was effective at increasing the reading skills of at-risk kindergarten students, especially those students who experienced more of the program. Additionally, improved reading skills appear to be positively correlated with improved on-task behavior.

Key words: computer-assisted instruction, literacy, on-task behavior, at-risk
Dedication

This document is dedicated to my mother and to my husband.
Acknowledgements

Thank you to my friends and family who have always supported and loved me. To my parents who always taught me to believe in myself, told me that I could do anything that I wanted to do, and who taught me to trust myself. To my mother who inspired me to live my life by the motto that “it is what it is, so make the best of it.” It has served me well. And to Jason, who has endured five years of graduate studies, four years of a long-distance relationship, and now a lifetime of paying off student loan debt to make it all happen.

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Chapter 1: Introduction

School failure can negatively impact an individual’s self-esteem, social development, and education and employment opportunities. Failing to learn to read heavily influences these negative consequences (Lyon, 2001). Reading skills are foundational to all school-based learning (Lyon, 2001); therefore, reading and school success are effectively interwoven (Chambers et al., 2011). In fact, the ability to decode and comprehend text is essential for not only academic success, but for social success in our society as well (Hempenstall, 2004; Levy & Vaughn, 2002; Vaughn, Levy, Coleman, & Bos, 2002). Tragically, only about one-third of American fourth and eighth grade students read at or above the proficient level, and when achievement rates for students from low-income families are examined, these rates are even lower. In fact, 50% of those students eligible for the government free or reduced lunch program are performing below the basic level, and only 17% of such students are performing at or above the proficient level (National Assessment of Educational Progress (2011).

Poverty can have a devastating impact on a child’s academic achievement in general, and on literacy in particular (Neuman, 2008a). Children from impoverished families often begin kindergarten with fewer prereading skills than their more affluent peers (Hart & Risley, 1995), and are at an increased risk for school failure (Parkinson & Rowan, 2008). In fact, children from low socioeconomic backgrounds are twice as likely
to read below basic levels compared to their peers from higher social strata (Perie, Moron, & Lutkins, 2005). Despite this finding, a causal relationship has not been established between poverty and reading failure (Mayer, 1998).

The effects of poverty are complex (e.g., increased health risks, increased risk for social behavior problems, etc.; Brooks-Gunn & Duncan, 1997) and are likely mediated by other factors, rather than family income alone. For example, children from low-income families disproportionately reside in urban areas and often attend low-performing elementary schools, placing them at an even greater disadvantage (Lee & Burkam, 2002). Further, urban schools often have student populations that have a higher percentage of at-risk students. This means that urban educators working in low-income districts are challenged to identify and meet the literacy needs of children from impoverished families who may be transient, have high rates of absenteeism, or have limited academic support at home (Gardner & Hsin, 2008). Therefore, schools serving a high number of disadvantaged children have higher rates of reading failure and fewer resources to accommodate at-risk students (Chambers et al., 2011).

If educators are to assist these children in closing the achievement gap, instructional time must be utilized effectively. Moreover, resource constraints make it essential for these schools to employ instructional tools that are both effective and efficient at instructing reading skills to the most-difficult-to-teach readers. One promising tool for improving reading instruction for these students is computer-assisted instruction (CAI), which requires less monetary and human resources than teacher-directed interventions, and may provide an opportunity for improving reading achievement for at-risk students (Clarfield & Stoner, 2005; NRP, 2000). Research has
demonstrated that those computer-based programs that utilize evidence-based reading practices, such as presenting skills in a logical sequence, proceeding in small steps, presenting multiple opportunities to respond, and teaching to mastery (Rosenshine, 1987), have had some positive effects on learners’ reading behaviors (e.g., Gibson, Cartledge, & Keyes, 2011).

In general, the NRP (2000) recommends that explicit reading instruction be provided in five major skill areas: phonemic awareness, phonics, fluency, vocabulary, and text comprehension (NRP, 2000). For young students at risk of reading failure, explicit instruction in alphabetic principle and decoding is particularly vital for achieving reading success (NRP, 2000; Pullen, Lane, Lloyd, Nowak, & Ryals, 2005; Stein & Kinder, 2004). Moreover, it is recommended that students receive explicit reading instruction during the early primary grades (Rivera, Al-Otaiba, & Koorland, 2006; Rupley, Blair, & Nichols, 2009).

A reoccurring finding regarding early reading instruction is that “the trajectory of reading success or failure begins early in a child’s formal schooling” (Kame’enui & Wallin, 2006, p. 381). To demonstrate, seventy-five percent of those students who are poor readers in third grade are also poor readers in ninth grade (Fletcher & Lyon, 1998) and approximately one in eight children not reading at grade level at the end of first grade will never read materials at his or her grade level (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Honig, 1998; Juel, 1988). Additionally, effective reading instruction prior to third grade has been found to be more efficacious, both in time required to produce changes and outcomes produced, than treatment provided later in a child’s schooling (Moats & Foorman, 2008). Therefore, effective early literacy instruction is
important for all students, but is particularly critical for students from low-socioeconomic backgrounds, as these children often begin school with skill levels below those of their same-aged peers (Bursuck & Damer, 2010; Hart & Risley, 1995).

Young children who are at risk for reading failure are also at increased risk for behavior problems in schools (Vaughn et al., 2002). In fact, children who experience difficulties in learning to read may be more likely to engage in chronic disruptive behavior (Gardner & Hsin, 2008). Moreover, children who engage in high levels of off-task behavior may not adequately benefit from reading instruction provided in the general education classroom alone, further perpetuating the cycle. Not surprisingly, the combination of poor reading achievement and behavior problems places children at increased risk for school failure (Walker, Colvin, & Ramsey, 1995; Walker & Severson, 2002).

Although poor reading achievement and social behavior problems are correlated, a causal relationship between the two concerns has not been demonstrated in the research. Nonetheless, preventing reading failure through effective instruction may influence the frequency of a student’s behavior problems. Scott, Nelson, and Liaupsin (2001) posit that the challenging behavior that is often seen in schools is the predictable outcome of a series of events beginning with academic failure, and a limited number of studies have shown that when the reading skills of young learners with behavior problems were improved, there were also positive changes in those learners’ social behavior (e.g., Lane, O’Shaughnessy, Lambros, Gresham, & Beebe-Frankenberger, 2001; Lane, Wehby, Menzies, Gregg, & Doukas, & Munton, 2002).
Although it would be naïve to think that academic success alone can eliminate all problem behaviors in schools, it is possible that if children at risk for chronic behavior problems receive effective instruction, especially in the area of reading, they might be less inclined to engage in inappropriate school behavior (Gardner & Hsin, 2008). Accordingly, the identification and implementation of effective reading strategies for children at risk for both reading failure and high rates of off-task behavior may prove to be of the upmost importance in changing the current dismal outcomes for these children (Wehby, Lane, & Falk, 2005).

Purpose

The ability to read is associated with both academic and occupational success (Lyon, 2001). However, our schools are not adequately preparing our students to be proficient readers and our failings are more apparent for students from low-income backgrounds attending urban schools (Lyon, 2001). These students often begin school at greater risk of experiencing reading failure and supplemental early reading instruction is often required to mitigate skill deficits (Bursuck & Damer, 2010). Additionally, students who demonstrate reading difficulties in the early primary grades generally continue to have reading problems throughout their schooling (Hall & Moats, 1999; Stanovich & Siegel, 1994).

A majority of students who experience reading difficulties and who engage in high rates of aberrant behavior spend a large part of the school day in a general education classroom (U.S. Department of Education, 2006). This means that these students require the academic and social skills necessary to participate in classroom instruction and to effectively function within this environment. Although a great deal of the research
conducted with this population has focused on decreasing problem behavior, potentially inspired by the notion that students must be able to behave appropriately before they can be instructed (Gardner & Hsin, 2008), a number of studies have also demonstrated positive effects of increasing reading skills on levels of problem behavior (e.g., Wehby, Falk, Barton-Arwood, Lane, & Cooley, 2003; Wehby et al., 2005).

This relationship, albeit unclear, between academic skill deficits and aberrant behavior (e.g., Beck, Burns, & Lau, 2009; Wehby et al., 2003; Wehby et al., 2005) points to the need for further investigation of the influence of reading achievement on levels of engagement as well as the determination of effective instructional tools to increase reading achievement for at-risk students. The current study sought to extend the existing literature with the primary purpose being to evaluate the effectiveness of supplemental, computer-based reading instruction on increasing reading achievement of kindergarten students with concomitant reading and social skill deficits. Additionally, the relationship between reading achievement and engagement during classroom instruction was examined.

The following research questions were addressed:

I. What effects did supplemental reading instruction using the Headsprout Early Reading program have on the reading achievement of kindergarteners with concomitant deficits in reading and social behaviors?

   a. What were the effects on program-related reading achievement assessments?
II. What effects did the Headsprout Early Reading program have on post-standardized measures compared to pre-test scores?

III. What effects did the Headsprout Early Reading program have on the levels of on-task behavior during general education reading instruction?

IV. How was the supplemental reading instruction viewed by the classroom teacher, as indicated by responses to a questionnaire?

V. What effects did the supplemental reading instruction have on parents’ perceptions of their children, as indicated by responses to a questionnaire?

VI. What effects did the supplemental reading instruction have on the target participants’ attitudes about the program, their reading skills, and their on-task behavior?
Chapter 2: A Review of the Literature

Reading failure comes at a high cost to individuals, our educational system, and society at large (Chambers et al., 2011; Stein & Kinder, 2004). A strong correlational relationship exists among illiteracy, unemployment, poverty, and crime (National Institute for Literacy, 1998). That is, individuals with reading difficulties are less likely to be employed compared to more literate individuals (Snyder, Dillow, & Hoffman, 2008); 43% of people with the lowest levels of literacy skills live in poverty (National Institute for Literacy, 1998); and at least half of adolescents and young adults with criminal records have reading difficulties (Lyon, 2001). Further, children who do not learn to read are more likely to require special education services, have low self-esteem, engage in delinquent behavior, and drop out of school before graduating (Chambers et al., 2011; Lyon, 2001). For example, of the 10-15% of those students who drop out, approximately 75% report reading difficulties and only 2% of those students receiving special education services for reading complete a four-year college program (Lyon, 2001). The negative effects of reading failure are not only witnessed during schooling years but long after as well, on both the individual and societal levels. Dealing with the high levels of reading failure in our country is both necessary and possible.

This chapter outlines the current levels of reading proficiency in America, the skill deficits that many children from impoverished backgrounds have, and the importance of early, explicit phonics instruction for at-risk students. Additionally,
research regarding Computer-Assisted Instruction (CAI) and the potential benefits of reading instruction may have on levels of aberrant behavior are discussed.

**Current Reading Proficiency Levels**

In 1998, it was estimated that at least ten million school-aged children were poor readers (Fletcher & Lyon, 1998). Currently, only about one-third of American fourth and eighth grade students read at or above the proficient level and 24% of eighth grade students read *below* the basic level of achievement, meaning these students do not have the necessary prerequisite skills to perform grade level tasks (National Assessment of Educational Progress, 2011). Although the overall reading achievement levels of American students have held steady over the past two decades, reading scores for children living in poverty continue to decline (Hempenstall, 2004). The percentage of students with proficient reading skills that live in low-income households and attend urban schools is dismal. It is estimated that 60% of children living in poverty and 47% of students in urban schools read *below* the basic level (Hempenstall, 2004). Further, only 17% of students eligible for free or reduced lunch are performing at or above the proficient level (NAEP, 2011).

**Effects of Poverty on Reading Achievement**

Children living in poverty, compared to children from middle-class homes, are much more likely to be placed in special education, to be retained, and to drop out of school (McLoyd & Purtell, 2008). Children who are poor are consistently identified as at-risk for academic failure and are disproportionately more likely to experience reading difficulties (Adams, 1990; Lyon, 2001). These students are more likely to have weak
phonological skills and print-related knowledge, smaller vocabularies, and less general background knowledge, all of which are necessary for reading success (Torgesen, 2004a).

A child’s experiences, such as exposure to spoken language and literacy artifacts (e.g., books, pictures, and television), contribute to his or her reading readiness (Hart & Risley, 1995; Hoff & Tian, 2005). The influence of these environmental variables has been shown to be related to the social strata of the parent and differences therein have been noted as resulting in discrepancies in cognitive-linguistic performance, emergent literacy skills, and overall school achievement (Hoff & Tian, 2005; McLoyd & Purtell, 2008). Children from economically disadvantaged backgrounds are more likely to lack rich language and literacy experiences, and often have less access to educational toys prior to beginning their schooling (McLoyd & Purtell, 2008). For example, children from low-income households are less likely, compared to children from more affluent households, to have language-promoting interactions with parents (Arnold & Doctoroff, 2003; Evans, 2004). Additionally, prior to entering school, children from low-SES families, on average, receive 25 hours of one-to-one storybook reading whereas children from middle-class families receive 1,000 to 1,700 hours (McLoyd & Purtell, 2008).

Exposure to print materials and diverse spoken language help establish background knowledge and build strong vocabulary skills, both of which are vital to becoming a skilled reader. Extensive background knowledge and strong vocabulary skills are required to connect new information with previously learned information and to comprehend topic-specific text. The limited literacy and language exposure that many children from low-income backgrounds experience often results in smaller vocabularies and weaker oral language skills (Greenwood, 2008; Neuman & Celano, 2006). Skill
deficits in these areas can result not only in more difficulty with reading comprehension but also more difficulty in developing strong phonemic awareness skills, ultimately making learning the alphabetic principle more difficult (Dickinson & Tabors, 1991; Fletcher & Lyon, 1998; Waldron-Soler & Osborn, 2004).

Children from low-income backgrounds often come to school without the skills necessary to experience school success (Hart & Risley, 1995; Neuman, 2008b). The performance discrepancies between low-income and middle- to high-income students can be seen prior to and at the start of formal schooling, and these differences only widen as children progress through the grades. In general, children from low-SES families experience lower achievement in grades one through six, with this gap widening to more than three grade levels by the end of sixth grade (Greenwood, 2008). Moreover, students attending low-income schools tend to spend less time actively engaged in academic responding (Greenwood, 2008). Therefore, in order to ameliorate this achievement gap, children at risk for academic failure must receive effective instruction from the onset of formal schooling.

**Importance of Early Intervention**

The probability of achieving reading success can be predicted by a student’s reading performance during the first three years of schooling (Kame‘enui & Wallin, 2006). Children who do not develop basic reading skills by third grade are unlikely to ever read grade-level materials, have extreme difficulty achieving average levels of reading fluency, and have decreased reading comprehension skills (Francis et al., 1996; Honig, 1998; Juel, 1988; Torgesen, 2004b). In fact, approximately 70% of children who are at risk for reading failure when they enter first grade will continue to experience
reading difficulties into adulthood (Lyon, 2001). Further, the decoding skills a child possesses in first grade can effectively predict up to 90% of his or her reading comprehension skills in third grade, and nearly 40% in ninth grade (Honig, 1998).

These skill deficits may be caused in part by what has been referred to as the Matthew effect (Stanovich, 1986), in which those with the weakest skills read the least and thus learn less whereas those with the strongest skills read more (Cunningham & Stanovich, 2001). Even though increased reading is required to bolster skills, research has demonstrated that poor readers are exposed to much less text and are less likely to read than their more skilled peers. By middle school, a proficient reader reads, on average, at least ten million words during an academic year, whereas a struggling reader reads less than one hundred thousand words (Lyon, 2001). As expected, this discrepancy results in a further widening of the gap between students with proficient and basic, or below basic, skills (Cunningham & Stanovich, 2001).

Despite these outcomes, most children who begin formal schooling at risk for reading difficulties can learn to read at average or above average levels if they experience intensive, systematic, and explicit reading instruction (Lyon, 2001). It has been estimated that exposure to comprehensive reading instruction early on can reduce the number of children reading below the basic level to less than 6% (Lyon, 2001). Intervening early with intense and appropriate instruction can prevent problems with beginning stages of literacy acquisition (Moats & Foorman, 2008) and keep almost all struggling readers from continuing down the path of experiencing reading difficulties and a lifetime of illiteracy (Torgesen, 2004a). As demonstrated by the limited gains for a majority of older students with severe reading difficulties, even when receiving special education services
(Moats & Foorman, 2008), early intervention is much more efficacious than intervening later in a student’s schooling. In fact, if intense intervention occurs at the start of kindergarten for the lowest-performing students, the achievement gap between the students with the fewest skills and their low-risk peers can be closed in a few months. However, by the time these children have completed third grade, an additional year of intense reading instruction would be required to make that same impact (Parkinson & Rowan, 2008).

Proficient reading is essential to school success (Chambers et al., 2011) and the detrimental effects of reading difficulties are witnessed early (Lyon, 2001). Children who have a difficult time learning to read are more prone to develop negative feelings about themselves (Chapman, Tunmer, & Prochnow, 2000), are more likely to become frustrated and engage in aberrant behavior, and are at a greater danger of experiencing academic failure (Volpe, Burns, DuBois, & Zaslofsky, 2011). Therefore, intensive instruction during the early years of schooling is vital if we are to change the current statistics, and deleterious outcomes, for children at risk for reading failure (Farkas & Beron, 2001; Honig, 1998).

**Effective Reading Instruction**

The National Reading Panel (2000) identified phonemic awareness, phonics, fluency, vocabulary, and text comprehension as the five necessary components of effective reading instruction. In other words, to be considered a strong reader, a child must possess proficient skills in each of these five domains. Although each component refers to a specific skill set, they are also intertwined with each influencing the learning of the others. *Phonemic awareness* is the highest level of phonological awareness and
refers to the knowledge that words are comprised of sounds that follow distinct patterns. It includes the ability to detect and manipulate individual phonemes in words (e.g., segmenting and blending; Bursack & Damer, 2011). Phonemic awareness is said to assist in learning the alphabetic principle (grapheme-phoneme relations), which is essential to learning phonics (Ehri, 2004). Phonics refers to the rules of language that are necessary to decode words. This includes the ability to segment words into their sounds and also to blend sounds into words (i.e., decoding). A strong phonics base is essential to learning to read words in isolation as well as connected text (Bursack & Damer, 2011). After developing automaticity in word recognition, reading fluency can be developed. Fluency refers to accurate, quick reading with appropriate tonal expression and is said to mark proficient reading (Stahl, 2004). Vocabulary, or the knowledge of words’ meanings, plays a vital role throughout the reading process, from the development of phonemic awareness and phonics knowledge to the ability to comprehend text (Cunningham & Stanovich, 2001). Finally, reading comprehension includes the ability to derive meaning from read text. Text comprehension is contingent on strong skills in each of the other four skill areas and is the ultimate purpose of reading (Grossen & Carnine, 1991).

For beginning readers, the importance of providing explicit, systematic instruction in the alphabetic principle is great (NRP, 2000). Research shows that explicit teaching of letter-sound correspondence positively influences decoding skills, reading comprehension, and spelling skills (NRP, 2000). In fact, “that direct instruction in alphabetic coding facilitates early reading instruction is one of the most well established conclusions in all of behavioral sciences” (Stanovich, 1994, p. 285-286). Explicit phonics instruction teaches phoneme-grapheme relations and allows for the application of that
knowledge when reading words (i.e., decoding; Ehri, 2004; Torgesen, 2004b). Further, automatic word recognition then allows fluent reading of connected text and supports comprehension (Moats & Foorman, 2008). Contrarily, the absence of strong decoding skills requires students to rely on context-based strategies, which are only effective about 10-25% of the time (Honig, 1998).

Although the specific instructional activities that produce the greatest gains have not yet been identified, research has clearly demonstrated that explicit and systematic phonics instruction is highly effective for improving reading skills (Scammaca, Vaughn, Roberts, Wanzek, & Torgesen, 2007). Explicit phonics instruction is beneficial for all students (Torgesen, Brooks, & Hall, 2006), regardless of SES background (NRP, 2000), but is especially effective for young, at-risk readers (Ehri, 2004; Hatcher, Hulme, & Snowling, 2004; Stein & Kinder, 2004). In fact, explicit phonics instruction can mitigate reading difficulties for such students (Fletcher & Lyon, 1998).

A wide variety of interventions have been utilized to increase the decoding skills of young, at-risk readers (Torgesen, 2004b). For example, Pullen et al. (2005) demonstrated that explicit decoding instruction can significantly improve the accuracy and frequency of pseudoword reading for at-risk first grade students. Using a multiple baseline design across groups of students, instruction in alphabetic principle, decoding of words, and reading of connected text was provided. During each session, students read a book chorally, were taught how to segment and blend selected target words using manipulative letters, and then chorally re-read the book. During the word work portion of the session, students completed approximately 25 manipulations by creating word variations. For instance, using the target word *am*, students could make the words *ham*
and *ram*. Students manipulated the initial sounds during the early lessons and the medial and final sounds as they progressed through the study. Although the improvement in the reading of pseudowords was gradual for some of the participants, significant increases were demonstrated. On average, students read pseudowords with 46.5% accuracy during baseline compared to 86.5% accuracy after 10 lessons.

In another example, supplementary reading instruction using the Scott Foresman’s Early Reading Intervention (ERI), a scripted program that focuses on phonological awareness skills, alphabetic understanding, word reading, and word writing skills, increased the reading outcomes of eight low-income students attending an urban elementary school (Musti-Rao & Cartledge, 2007). Seven of the participants were in kindergarten, one was in first grade, and all were making inadequate progress on reading assessments (i.e., participants did not meet Fall Benchmark goals and scored below grade level on the WJ-III Word Attack subtest). Using a multiple baseline across students design, students were provided instruction in small groups, for 20-minute sessions three days per week. The supplemental instruction increased the students’ phonological awareness skills (i.e., increased performance on DIBELS Phoneme Segmentation Fluency) and alphabetic principle and decoding skills (i.e., letter-sound correspondence knowledge and DIBELS Nonsense Word Fluency). Furthermore, five of the seven participants’ instructional recommendations changed from pre- to post-assessments, with four of the participants reaching Benchmark by the end of the year.

A strong literature base exists supporting the positive effects of explicit, systematic phonics-based instruction, especially for young children at risk of developing future reading difficulties, including children from low-income households attending
urban schools (Musti-Rao & Cartledge, 2007; Pullen et al., 2005; Vadasy & Sanders, 2008). Regardless of the specifics of the procedures utilized, letter-sound relations and word attack strategies must be explicitly and systematically taught to develop proficient reading skills (Carnine, Silbert, & Kame’enui, 1997). In short, strong phonics skills are foundational for overall reading achievement and must be explicitly taught during beginning literacy instruction to help ensure future reading success (Bursack & Damer, 2011; Ehri, 2004; Snow, Burns, & Griffin, 1998; Vadasy & Sanders, 2008).

Although research has demonstrated that explicit, systematic instruction in beginning reading skills is vital to achieve literacy success for at-risk students, this does not guarantee that all at-risk students receive such instruction. In fact, children attending schools in low-income districts are often the least likely to receive such practices (Chambers, Abrami, McWhaw, & Therrien, 2001). This is a result of many factors, such as these schools employing a high number of inexperienced and low-performing teachers and having limited resources (Hempenstall, 2004; Lyon & Chhabra, 2004). Additionally, approximately 70% of the student population attending these schools does not have proficient reading skills (Lyon, 2003). A potential solution to assist such schools is to provide access to computer-assisted, or computer-based, instruction. The use of computer-assisted instruction (CAI) requires less school personnel (e.g., less direct attention from the classroom teacher) and can be used with multiple students at a time (e.g., small or large group), making such instruction highly valuable in urban schools as they often have the highest need and the fewest resources (Gibson, Cartledge, & Keyes, 2011).
Computer-Assisted Instruction

Research has shown that computers can be used effectively to teach various literacy skills, including phonological awareness, decoding, sight word reading, fluency, spelling, and reading comprehension to students with and without disabilities (e.g., Jones, Torgesen, & Sexton, 1987; Lee & Vail, 2005; Macaruso & Rodman, 2011; Mayfield, Glenn, & Vollmer, 2008; Torgesen, Waagner, Rashotte, Herron & Lindamood, 2010). For example, Gibson and colleagues (2011) conducted a preliminary investigation using the Read Naturally Software Edition (RNSE) with eight first-grade students attending an urban school. The effects of the computerized reading program on the oral reading fluency (ORF), reading growth rates, and comprehension of each student were assessed. The Read Naturally program was utilized three to four times per week. During each session, three to five key words from the target story were presented to the student (the word was presented visually and the computer said the word out loud). Then, the student completed a one-minute cold read in which he or she could click on any unknown words and the program would provide the correct pronunciation; a read-along reading; a five question comprehension test; and a reading checkout monitored by the researcher. The computer initiated the cold readings and practice readings and the student was instructed to click the last word read at the end of the one-minute timing. Fluency aims were set for each story and students only progressed to the next story after reaching the aim.

The number of words read correctly (i.e., ORF) served as the primary dependent variable measured using the DIBELS Winter and Spring assessments as the pre- and post-tests, respectively. Additionally, students completed comprehension questions following passage reading. All eight participants increased the number of words read
correctly per minute (CWPM) and demonstrated improved reading comprehension. Students gained an average of 19 CWPM and 7 of the participants achieved accelerated reading growth rates during the RNSE intervention. Moreover, five of the eight participants reduced their risk status by one level.

Using a multiple-baseline design across pairs of students, Volpe et al. (2011) examined the effects of incremental rehearsal using a computer-assisted tutoring program on the letter sound fluency of four kindergarten students who did not respond to the Tier two instruction provided in their urban school. The authors used the Tutoring Buddy program to instruct letter sounds using an 80-20% ratio of known to unknown letter sounds. The participants gained between six and nine new letter sounds and demonstrated near or above expected growth rates for Kindergarten students; however, given the low initial skill level, the growth rate was not sufficient to achieve Spring benchmarks.

CAI has been demonstrated to effectively provide intensive reading instruction for struggling readers (Wise, Ring, & Olson, 2000). In fact, some research indicates that CAI is most effective for lower-performers. Macaruso, Hook, & McCabe (2006) utilized the Phonics Based Reading computer program (PBR; Lexia Learning Systems, 2001), which directly and systematically teaches word-attack strategies, with 83 first graders who attended 1 of 5 schools in a large urban district. Eighty-four students served as the control group who did not receive additional instruction; however, all students received classroom instruction using a phonics-based curriculum. Following the six months of intervention, all students (treatment and control) showed significant gains in reading achievement as assessed by The Gates-MacGinitie Reading Test (MacGinitie, MacGinitie, 2000), and no significant differences were found between the control and
treatment groups. However, when only the data of those students who were Title-1 eligible were examined, significant differences were found between the groups. For those students exposed to the treatment, students eligible for Title 1 performed lower than non-Title 1 students at pre-test but had caught up by post-test, meaning the low-performing students made greater gains compared to higher-performing students exposed to the intervention. Title 1 students in the control group did not demonstrate such gains. Rather, these students performed lower at pre-test and remained below non-Title 1 students at post-test.

Not only is CAI useful for teaching reading skills to at-risk learners, it may provide even greater utility to urban schools given that instruction can be provided in small groups. Comaskey, Savage, and Abrami (2009) utilized the ABRACADABRA computer program, which focuses on letter-sound knowledge, phoneme blending, and reading comprehension strategies, to provide small group instruction to 27 kindergarten students. Students received intervention in groups of four and took turns accessing the computer mouse. Sessions occurred 3 days per week for 15 minutes. Improvements in letter-sound knowledge, as measured by presenting the 26 letters of the alphabet in random order on a page, and word reading skills, as measured by performance on the Wide Range Achievement Test Word Recognition Subtest, were demonstrated.

To further illustrate, Chambers et al. (2011) demonstrated that CAI might be more time-efficient than teacher-directed instruction. Chambers and colleagues (2011) examined the effects of small-group, computer-assisted tutoring compared to teacher-directed, one-on-one tutoring on the reading achievement of low-achieving first and second grade students. Participants attended 1 of 33 high-poverty Success for All Schools
in 9 states. Students were either assigned to the computer-assisted tutoring group in which the author-developed program, Team Alphie, was utilized, or to the person-directed tutoring group (i.e., the control group). In the Team Alphie condition, students were in groups of 6 and sessions were conducted 4 times per week for 45 minutes. Instruction was provided on the five components of effective reading instruction (NRP, 2000), with a focus on decoding and fluency, and was aligned with classroom instruction. Cooperative learning strategies were also utilized in which each pair of students worked together to complete the computer lesson. Students in the control group received individualized instruction for 20-minute sessions 4 times per week. The Woodcock Reading Mastery Test (WRMT) Letter-Word Identification was conducted as a pre- and post-test measure, while the WRMT Word Attack and Passage Comprehension assessments were conducted as post-test-only measures.

Team Alphie was more effective than the traditional one-on-one tutoring at increasing reading achievement for first graders; however, no differences were found between the groups on the reading achievement of second graders. Additionally, schools using Team Alphie were able to tutor 31% more first graders and 46% more second graders than those schools using one-on-one tutoring. Although the computerized tutoring was shown to be more effective and efficient, it is not clear which components of Team Alphie (e.g., embedded multimedia, cooperative learning, computer-assisted instruction) produced such effects. Moreover, sessions were longer for the Team Alphie group, so it is possible that the amount of instructional time, as opposed to the way the instruction was provided, accounted for the differences between the groups.
CAI programs can be implemented with relatively little training, are adaptive, and can be used to supplement classroom instruction (Chambers et al., 2011). Further, the use of computers to deliver reading instruction can function as a motivational device (NRP, 2000) and may be more time and cost-effective (van Dall & Reitsma, 2000), especially for teachers with large class sizes. Additionally, CAI may help address the Matthew effect (Stanovich, 1986) by providing students with the lowest skills, and therefore the students who are less likely to read, additional opportunities to engage in reading activities by providing supplementary instructional time and practice (Hall, Hughes, & Filbert, 2000).

Although computer-based instruction has not been recommended to serve as the primary form of instruction (NRP, 2000), such instruction has been deemed effective as a supplementary instructional tool. CAI offers individually paced instruction, additional practice as needed, and provides immediate, consistent, and effective corrective feedback (Hall et al., 2000; Rieth & Semmel, 1991; Woodward et al., 1986). However, it must be noted that the benefits of CAI are dependent on frequent and consistent use (Hecht & Close, 2002). Further, those CAI programs that utilize instructional procedures found to be effective for reading instruction have been found to provide the most impact (Macaruso & Rodman, 2011). Such strategies include actively engaging a student; high to moderate success rates; increased opportunities to learn; direct teaching of the skill; and strategic, explicit, and carefully scaffolded instruction (Ellis, Worthington, & Larkin, 1994). One program that incorporates such instructional tactics is the Headsprout Early Reading program (www.headsprout.com).

**Headsprout Early Reading program.** The Headsprout Early Reading program (www.headsprout.com) is a research-based, interactive, online computer program. It
consists of 80 lessons that the student moves through at his or her own pace with built-in assessment and progress reports. Children travel through Space World, Dinosaur World, Undersea World, and Jungle World where various characters provide feedback for correct responses. The program provides explicit and direct teaching of phonics skills (e.g., letter-sound correspondence and word decoding); immediate corrective and positive feedback; scaffolding (e.g., new skills are introduced with prompts that are faded as the student progresses through the lesson); repeated practice and judicious review (e.g., targets are practiced several times throughout a lesson and all targets are reviewed throughout the program); high to moderate success rates; and active engagement (e.g., the student is required to click on words and to speak out loud to the instructional stimuli; Honig, 1998). This program provides individualized, differentiated, and highly engaging instruction allowing for frequent response opportunities and high rates of success and reinforcement (Clarfield & Stoner, 2005).

Headsprout Early Reading (www.headsprout.com) also addresses the five components of effective reading instruction (NRP, 2000). For example, phonemic awareness is targeted through activities such as clicking on a sound or sound element within a word and selecting the correct character after hearing a word segmented and blended. Phonics skills are emphasized through the explicit teaching of letter-sound relations and segmenting and blending practice. Fluency is promoted by incorporating exercises in which students are required to respond at a specified rate. For example, students are instructed to click on sounds in words and if the student does not click quickly enough, a prompt is provided and the activity is restarted. Vocabulary is targeted by building a sight word vocabulary and by focusing on those words that are most likely
to be in a child’s spoken vocabulary. Finally, reading comprehension skills are taught and assessed by activities such as reading a sentence and then clicking on the corresponding picture.

The program provides specific target skills for each lesson and guides students through each lesson as it emphasizes the following components recommended for effective early literacy: (a) explicit instruction in alphabetic principle (grapheme-phoneme correspondences are taught), (b) teaching to read for meaning (students select corresponding pictures that match the text), and (c) opportunities to read connected text (carefully designed, decodable stories are provided; NRP, 2000).

The development of the Headsprout Early Reading program was based on rigorous scientific testing. Initially, the developers observed students interacting with the program and asked them to explain why they made the responses they made. Second, various parts of the program were tested with different populations in different settings to determine which students learned which targets (validation testing). Third, the program continued to be assessed in its entirety across populations and changes were made as necessary (field testing). Throughout this process, the program continued to be revised until 90% of the learners who interacted with program achieved 90% accuracy on all activities (Layng, Twyman, & Stikeleather, 2003).

Despite Headsprout having a strong empirical foundation (i.e., the program has been rigorously tested with numerous students), few peer-reviewed studies were found. In one study, Pindiprolu and Forbush (2009) examined the effects of two computerized programs, Headsprout Early Reading and FUNNIX, implemented by the parent, on the acquisition of early literacy skills of 25 kindergarten, first-grade, and second-grade
students. All participants scored below the 15th percentile in reading achievement and lived in either an urban or rural community in Idaho or Utah. Seven of the participants had completed kindergarten, six had completed first grade, and twelve had completed second grade. Eight participants received special education services and ten received Title-1 services. The study took place over the summer and all sessions occurred in the participants’ homes.

Thirteen and twelve participants were assigned to the Headsprout and FUNNIX programs, respectively. Participants were assigned to the Headsprout condition if their home had Internet access or to the FUNNIX condition if it did not. Parents were taught how to implement the program and were asked to deliver reading instruction five days a week for eight weeks. They were given daily log progress sheets to record the dates each lesson, or episode, was completed. FUNNIX is a CD-based Direct Instruction (DI) program that is adult-mediated and requires students to complete a corresponding workbook whereas, Headsprout is predominately student-mediated. Both programs provide direct and explicit instruction. The DIBELS progress monitoring probe number 19 for Initial Sound Fluency (ISF), Word Use Fluency, Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), Retell Word Fluency (RWF), Oral Reading Fluency (ORF) and the K-3 Benchmark Letter Naming Fluency (LNF) assessments served as pre- and post-tests (Good & Kaminski, 2002).

Both reading programs produced statistically significant changes on at least one DIBELS assessment. Those students in the FUNNIX group demonstrated medium gains on Word Use Fluency, small gains on PSF, ISF, and NWF; however, negative gains were demonstrated on LNF. Those students receiving instruction from Headsprout
demonstrated large gains on PSF and small gains on Word Use Fluency; however, negative gains were found on LNF, ORF, and NWF. Overall, no statistical difference was found between the two groups on overall reading achievement. However, those students in the Headsprout group indicated a stronger liking of the program compared to those students in the FUNNIX group. Moreover, 92% of the students in the Headsprout group, compared to 85% in the FUNNIX group, stated that the program helped them learn to read. Although this information is useful, it contradicts the outcomes of the study based on the data (i.e., Headsprout resulted in gains on two measures and FUNNIX resulted in gains on several measures). Several limitations exist for this study, including a small sample size, the non-random assignment of participants to groups (i.e., students were assigned to the Headsprout group if the home had internet access), with the most important limitation being the inability to state that the intervention was implemented with fidelity. Without this information, definitive conclusions cannot be made regarding the effectiveness of the Headsprout Early Reading program on increasing the reading skills of young, at-risk learners.

Huffstetter, King, Onwuegbuzie, Schneider, and Powell-Smith (2010) addressed this limitation by measuring treatment fidelity. Sixty-two participants attending a Headstart preschool were equally divided into an experimental group or the control group. All participants met poverty guidelines and received free or reduced lunch and 32 spoke English as a second language. The experimental group completed the first 40 Headsprout lessons and the control group was exposed to the Millies Math House computer program to control for additional exposure to instruction as well as CAI exposure. The classroom teacher who was trained to implement the program completed
all sessions; however, the researcher stepped in if the teacher did not provide adequate support or feedback.

The Test of Early Reading Ability, Third Edition (TERA-3) and the Test of Language Development-Primary, Third Edition (TOLD-P:3) served as the dependent variables. The experimental group showed significant gains and outperformed the control group on the reading and oral language measures. Prior to the intervention, all participants had reading quotients more than one standard deviation below average. Following intervention, the mean reading quotients of children using Headsprout closely approximated average performances but the gain in mean reading quotients for the control group was not significant. Prior to intervention, all participants had mean language quotients more than one standard deviation below average. Following intervention, those children exposed to Headsprout scored within the average range whereas the mean language quotient of children in the control group remained more than one standard deviation below average. Treatment integrity was assessed and the researchers found that the teachers implemented the program appropriately; however, implementation was not perfect. This means that Headsprout can still be effective even when it is not perfectly implemented. In addition, teachers found it to be useful and easy to implement.

**Limitations of computer-assisted instruction.** CAI appears to be effective at increasing beginning reading skills, including teaching phonics and word reading skills to early elementary students at risk of experiencing reading failure and who attend urban schools. However, some limitations do exist. First, very few studies addressed maintenance or generalization (Hall et al., 2000). Second, many of the computer-based
programs utilize several components, so an experimental analysis is required to determine which features are necessary to produce the desired outcomes. Moreover, those components that must be refined to ensure that all students, especially non-responders, experience improved reading achievement should be examined.

Few studies assessed and/or reported treatment fidelity data, which severely hinders the conclusions that can be made regarding the effectiveness of CAI. Additionally, two of the stated advantages of using CAI are the ease of implementation and high levels of student independence. It has been stated that CAI can be implemented by most adults with minimal training and can be implemented with multiple students simultaneously; however, supervision by a more able reader is necessary and vital to promote reading success for beginning, struggling readers. These students are prone to making errors (e.g., incorrect decoding and pronunciation) and errors must be corrected immediately to ensure accurate learning. Therefore, researchers should assess and document the level of supervision required, and provided, when utilizing CAI.

A paucity of CAI research exists and therefore, more research is needed in general (Hall et al., 2000). Additionally, contradicting evidence exists regarding the utility of CAI for low-performing students. Some studies have demonstrated greater effects for the lowest performing students (e.g., Cassady & Smith, 2004; Macaruso & Walker, 2008) whereas other studies have demonstrated greater gains for participants with the highest pre-test scores (Blok et al., 2002). Therefore, additional research is necessary to determine the effectiveness of CAI for at-risk, struggling readers.
Reading Instruction for Students who Engage in Problem behavior

Research has shown that students who experience reading difficulties often engage in aberrant behavior, such as aggression and high levels of off-task behavior (Wehby et al., 2005). Although a relationship has been established between reading deficits and aberrant behavior, the linearity of this relationship is unclear. For example, students may engage in problem behavior as a result of reading difficulties (i.e., avoidance) or students may experience reading difficulties due to engagement in problem behavior (i.e., problem behavior interferes with learning; Wehby et al., 2005). Regardless of the direction of the relation between reading difficulties and problem behavior, research has demonstrated that students who engage in problem behavior and who experience reading difficulties are at increased risk for school failure (Volpe et al., 2011). Therefore, there is a strong need to determine those educational practices that are most effective for students who engage in off-task behavior (Rabiner, Murray, Skinner, & Malone, 2010).

In general, a great deal of the research conducted with students with concomitant reading and behavior difficulties has focused on decreasing problem behavior, potentially inspired by the notion that students must be able to behave appropriately before they can be effectively instructed in academic areas (Wehby et al., 2003). Consequently, there are few research studies that have targeted instructional strategies for this population. However, the benefits of those practices used to effectively teach reading skills to compliant students for those students who engage in problem behavior have been examined.
A review of the research conducted by Rivera and colleagues (2006) found that peer-mediated instruction and Direct Instruction can effectively improve the reading skills of elementary children who engage in high rates of problem behavior. To illustrate, Cochran, Feng, Cartledge, and Hamilton (1993) used cross-age peer tutoring to improve the sight word skills of second graders diagnosed with an emotional or behavior disorder (E/BD). Fifth grade students with E/BD were trained as tutors and as a result of peer tutoring, the sight word vocabularies of both the tutees and the tutors improved. Additionally, the Great Leaps (Mercer & Campbell, 1998) fluency-training program and a Direct Instruction reading program, Reading Mastery 1 (Engelmann & Bruner, 1988), were implemented as a supplemental reading package for kindergarten students at risk for E/BD. Other students in the class only received the regular classroom reading curriculum. Not only did the intervention increase the participants’ reading skills, the at-risk students outperformed the other students in letter sounds, blends, and high frequency sight words (Trout, Epstein, Mickelson, Nelson, & Lewis, 2003).

Using the Phonological Awareness Training for Reading (PATR) (Torgesen & Bryant, 1994), the reading skills of seven first-grade students with low phonics skills and high rates of problem behavior were improved (Lane et al., 2001). Nelson, Benner, and Gonzalez (2005) also found similar results of improved phonological skills when they implemented the Stepping Stones to Literacy program (Nelson, Cooper, & Gonzalez, 2004) with kindergarteners at risk for behavior problems. Overall, researchers have found that explicit and systematic literacy instruction is effective in improving the reading skills of children with reading and social behavior problems (Falk & Wehby, 2001; Lane, et al., 2001; Trout, Nordness, Pierce, & Epstein, 2003).
**Effects of reading interventions on social behaviors.** Some researchers have recommended the utilization of academic interventions, namely reading instruction, to decrease aberrant behavior (e.g., Lingo, Slaton, & Jolivette, 2006). In other words, these interventions do not directly target social skills but rather target both academic and social skill deficits simultaneously by intervening directly on reading deficits. This line of research has shown that targeting reading skills may be sufficient to increase levels of on-task behavior for students with concomitant reading and social skill deficits (e.g., Lane et al., 2001; Wanzek, Vaughn, Kim, & Cavanaugh, 2006). For example, Ashcroft and Ashcroft (2005) demonstrated the effects of improved reading skills on increased levels of engagement during reading lessons and appropriate classroom behavior. A second-grade English Language Learner (ELL) student received instruction in basic reading behaviors and practiced reading decodable books. Initially, sessions were 15 minutes in length and occurred three days per week; however, after the fifth session, the student requested longer and more frequent sessions. Therefore, sessions were increased to 25 minutes in length and occurred five days per week. After only three sessions, the student sustained engagement in reading behaviors for 15 minutes with eventual increases to 25 minutes, compared to 5 minutes prior to intervention. Further, prior to intervention, the student engaged in aggressive behaviors and disrespectful interactions with the teacher; however, following intervention, the student engaged in appropriate and polite interactions with both his peers and teacher.

Beck, Burns, and Lau (2009) utilized an alternating treatments design to determine the effects of preteaching on the percentage of on-task behavior during reading instruction. One kindergarten and one third-grade male, both diagnosed with a behavior
disorder in the fall of their kindergarten year, served as participants. Preteaching occurred before classroom reading instruction and focused on the material for that day. Using incremental rehearsal, either letter sounds (kindergartener) or sight words (third grader) were taught. On-task behavior was measured during reading instruction using a momentary time sampling method with ten-second intervals. The percentage of on-task behavior increased for both participants above baseline conditions by about 30%. However, the effect of preteaching on reading skills is unknown because academic gains were not measured.

In another study, both reading and behavior gains were measured. Webby et al., (2003) utilized a multiple baseline across pairs to measure the impact of a modified, intensive reading program on the reading achievement and social behavior of eight elementary-aged male students who attended a self-contained school for kids with E/BD. Using a peer-instruction strategy, participants received a modified version of Open Court (Adams et al., 2000), implemented for 45 minutes of instruction 4 days a week, and Peer-Assisted Learning Strategy (PALS), implemented for 30 minutes of instruction 4 days per week. Phonemic awareness, phonics, comprehension skills, and spelling were targeted. Academic response measures consisted of weekly one-minute probes for the following targets: nonsense word fluency, blending probes, letter sounds, and sight words. Additionally, a pre- and post-segmentation probe, Woodcock Reading Mastery Test-Revised (WRMT-R; Woodcock, 1998), Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999), and the Peabody Picture Vocabulary Test-Third Edition (PPVT-III; Dunn & Dunn 1997) were administered.
The behavioral outcome measures included the percentage of time spent attending to material and frequency of inappropriate behavior during 20-minute observational periods conducted during reading instruction. Results indicated moderate increases for some participants on sound naming, blending, and nonsense words and a slight improvement in the average percentage of time spent attending for some individuals; however, the occurrence of problem behavior did not decrease. The intervention was in place for a relatively short period of time; therefore, it is possible that the modest gains in reading were not significant enough to produce a desired improvement in social behavior. Similarly, Lingo, Slaton, and Jolivette (2006) found that when students continued to perform below grade level in reading, modest improvements in oral reading fluency (ORF) were not sufficient to significantly improve inappropriate social behavior. Thus, the role reading deficits play in social behavior and the utility of increasing reading skills to improve off-task behavior requires further examination.

**Computer-assisted instruction.** In addition to teaching academic skills, there is some research backing, albeit small, for positive effects of CAI on improving on-task behavior for children who demonstrate difficulty attending during academic tasks (Din, 1996; Ota & Depaul, 2002). Rabiner and colleagues (2010) provided 60-minute, small-group CAI to students 2 days per week for 14 weeks. More significant gains on DIBELS assessments (Good & Kaminski, 1996) and improvements in on-task behavior during instructional sessions were demonstrated for students exposed to CAI, compared to those students exposed to an attention-training intervention and students in the control group.

Clairfield and Stoner (2005) evaluated the effectiveness of Headsprout Early Reading (www.headsprout.com) on the oral reading fluency (ORF) and task engagement
of three five- and six-year olds at risk for reading difficulties. Each of the participants had received a diagnosis of ADHD by a pediatrician or by using the Clinical Interview Parent Report Form (Barkley, 1997). The authors used a multiple-baseline across participants design. Sessions occurred for 20 to 30 minutes 3 times a week during non-academic time, and the participants completed 27, 24, and 21 episodes. The first grade DIBELS ORF (Good & Kaminski, 1996) probes were conducted once per week. The frequency of on- and off-task behavior (i.e., active engagement, passive engagement, and off-task behavior) was measured using 15-second partial interval recording during 10-minute observations. The on- and off-task behavior was measured during small-group reading instruction during the baseline condition and during the Headsprout lesson in the intervention condition.

CAI produced higher mean levels of oral reading fluency (ORF) and greater rates of growth than baseline rates for all students. A strong functional relation between Headsprout and ORF was demonstrated by 100% of non-overlapping data points across the series. An immediate decrease in the rate of off-task behavior was demonstrated for all participants upon exposure to the intervention. However, during baseline, the behavior observations were conducted during classroom reading instruction whereas during the intervention phase, the behavior observations were conducted during intervention sessions. Therefore, a direct comparison between the two measures cannot be made. Although, this study did not show that Headsprout effectively decreases problem behavior in the classroom, it does provide evidence that students who engage in high rates of off-task behavior may be more likely to remain on-task during CAI compared to teacher-directed instruction.
Limitations of research addressing problem behavior. Further research is warranted to help clarify the relationship between reading deficits and social behavior. There is some evidence that explicit reading instruction has a positive impact on the social behavior of children with a history of antisocial behavior (Lane et al., 2001; Lane et al., 2002; Wehby et al., 2003); however, these findings are not consistent and given the implementation of the studies, some gaps in the literature do exist.

Many of these studies were conducted for short periods of time resulting in improvements in the participants’ reading skills over baseline measures but not necessarily to grade level. It is possible that those studies that did not demonstrate improvements in social behavior were a result of reading skills not being increased to a functional level. It can be posited that if students do not gain those skills necessary to participate in classroom reading instruction, levels of on-task behavior will not be affected. Therefore, interventions should be implemented long enough to produce changes to a high degree so that the existence or nonexistence of a relationship between academic gains and social behavior can be determined. Further, some studies that examined the effects of academic interventions only measured behavioral outcomes. Whether or not the students are operating within their instructional level after intervention sessions must be determined; thus, it is essential to measure both academic gains as well as behavioral outcomes to determine a potential relationship between the two variables.

A discussion of potentially differentiated effects of improving reading skills on aberrant behavior has not been included in these studies. For example, if the student’s problem behavior is a result of not having those skills necessary to participate in
classroom instruction, it can be assumed that an intervention resulting in improved reading skills will result in improved classroom behavior. However, if the aberrant behavior is maintained by other contingencies such as if it is attention-maintained or is a result of inappropriate coping skills, the usefulness of an academic intervention to decrease levels of aberrant behavior may be significantly reduced. Finally, the effect of CAI on levels of on-task behavior outside of treatment sessions (e.g., during classroom instruction) has not been examined.

**Conclusion**

Children living in poverty are less likely to develop the skills necessary to support academic success. Children with underdeveloped language skills often experience difficulties in learning basic reading skills, making it more difficult to gain strong phonemic awareness skills (Cunningham & Stanovich, 2001). These skills are essential in learning alphabetic principle and proficient decoding skills, which are associated with more fluent reading, a larger vocabulary, and better text comprehension (Cunningham & Stanovich, 2001; Honig, 1998; Lyon, 2001; Moats, 1996). Therefore, it is vital that at-risk students receive effective reading instruction at the onset of formal schooling.

A strong research base supports the need for early reading instruction to focus on phonics and word-decoding strategies (Snow, Burns, & Griffin, 1998). Explicit, systematic instruction has improved the reading skills of at-risk students from low-income backgrounds (e.g., Musti-Rao & Cartledge, 2007), as well as those students who have reading deficits and engage in problem behavior (Gardner & Hsin, 2008). Despite this evidence, such interventions may be less effective for students with deficits in both areas compared to typical peers or students with a deficit in only one area. In a
longitudinal study, Kamps and colleagues (2003) analyzed the oral reading fluency (ORF), nonsense word fluency (NWF), and letter naming fluency (LNF) of 383 participants across 3 years using DIBELS assessments (Good & Kaminski, 1998). Overall, participants exposed to Direct Instruction (i.e., Reading Mastery) demonstrated more growth in reading skills compared to participants exposed to literature-based instruction (i.e., Success for All (1999)). However, regardless of the instruction provided, participants with either an academic or behavioral deficit made slower progress compared to their typical peers, and those students with both academic and behavioral deficits made the least progress. This demonstrates a need for further research to determine the most effective interventions for students with concomitant reading and social skill deficits.

Students who engage in disruptive or off-task behavior are less likely to receive instruction and spend less time engaged in instructional activities because they are often removed from the classroom for engaging in problem behavior. Researchers have discussed a cycle of negative reinforcement in which the student’s problem behavior is maintained by escape or avoidance of academic tasks (i.e., removal from the room) and the teacher’s removal behavior is maintained by escaping the child’s problem behavior (Lingo et al., 2006; Wehby et al., 2003). Thus, determining whether improving reading skills positively impacts social skills is important for this population.

CAI may prove useful in addressing the aforementioned needs. Increasingly, authors are arguing that technology can assist in ending the literacy crisis in our schools (Hasselbring, 2012). More and more software is available that is adaptive to individual student’s progress and learning, facilitates repetitive practice to help ensure mastery learning, processes data quickly, and provides the teacher with feedback on student
progress. Additionally, children are computer savvy at a young age and may find CAI to be more motivating than traditional teacher-directed instruction (Hasselbring, 2012).

The use of CAI to supplement classroom instruction has been recommended and is used to teach reading in many schools (Cassady & Smith, 2004; NRP, 2000). Despite this recommendation, little is empirically known about the utility of computer-based instruction to improve reading skills of at-risk students (NRP, 2000; Pindiprolu & Forbush, 2009). Some research has shown that CAI positively affects learning outcomes for students (Kulik & Kulik, 1991). However, other studies have produced negative gains (e.g., Pindiprolu & Forbush, 2009) and some researchers have argued that CAI is only minimally effective for improving the reading skills of struggling readers (Slavin, Lake, Davis, & Madden, 2011). The limited research available demonstrates that those programs utilizing the instructional tactics deemed effective at increasing reading skills result in the largest gains. Finally, little is known regarding the benefits of CAI for students with concomitant reading and social behavior deficits; therefore, more research is warranted to determine the effects for such students.

**Purpose**

Reading failure can negatively impact every facet of an individual’s life; therefore, it is essential that effective reading strategies be identified to teach the most struggling readers. It is especially important to identify instructional programs that can be effectively utilized within those schools serving a high percentage of at-risk students with limited resources. The purpose of this study was to extend the literature base in two ways: to determine the effects of computer-assisted instruction with at-risk readers who also engage in high rates of off-task behavior, and the utility of improved reading skills on
increasing on-task behavior. Specifically, the effects of Headsprout Early Reading on the reading skills of kindergarten students who demonstrated concomitant deficits in reading and social skills was assessed. In turn, the impact of the supplemental reading instruction on the on-task behavior of students during general education reading instruction was examined.
Chapter 3: Method

This chapter describes the process of conducting this study, including information regarding the participants, the setting in which sessions were conducted, and the procedures of each phase of the study (initial participant recruitment to post-assessments).

Participants and Setting

Participants were selected from a kindergarten classroom in an urban elementary school located in the Midwest. According to the Department of Education, the school did not meet adequate yearly progress (AYP) during the previous school year. The total student enrollment in pre-kindergarten through sixth grade is 427 students. The student population is 78% Black, 16% White, and 1% Hispanic with 67% of the students eligible for the free or reduced lunch program.

Prior to conducting the study, the teacher identified potential candidates (i.e., those who met either the target participant or comparison peer inclusion criteria) based on the students’ DIBELS scores and their behavior within the classroom during reading instruction. To be recommended as a target participant, the student had to score within the moderate to high at-risk category on the DIBELS Kindergarten assessment and considered to be “highly off-task” by the teacher. To be recommended as a comparison peer, the student had to score within the low-risk or above average category on the DIBELS Kindergarten assessment and considered to be “highly on-task” by the teacher.
The classroom teacher identified eight and two students who met the target participant criteria and the comparison peer criteria, respectively. Parental permission forms (Appendix A) were sent home with those students and permission was obtained for six target participants and one comparison peer. Upon receiving parental consent, each child was informed about the study and his or her assent was obtained (Appendix B). This study included seven participants (i.e., six target participants and one comparison peer). Information for the seven participants can be found in Table 1.

To participate as a target participant, \(^1\) the student had to perform at or below the 50\(^\text{th}\) percentile, based on the AIMSweb Tests of Early Literacy (TEL) national norms (www.aimsweb.com), on the Letter Sound Fluency (LSF) or the Nonsense Word Fluency (NWF) assessments (Winter Benchmark), and engage in off-task behavior more than 50\% of the general education reading instruction observation period (five minutes). To participate as a comparison peer, \(^2\) the student had to score above the 50\(^\text{th}\) percentile on the LSF and NWF assessments and engage in on-task behavior at least 80\% of the reading instruction observation period.

**Cher.** Cher was born 4.5 weeks premature, took medication for asthma and acid reflux, and experienced high fevers that resulted in a seizure as a toddler. She engaged in high rates of off-task behavior, mostly consisting of talking to peers, and was highly distractible (e.g., frequently shifted focus to non-instructional stimuli). She was highly

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\(^1\) *Target participants* refer to those students identified as at-risk for both reading and behavior difficulties and who experienced the intervention.

\(^2\) *Comparison peer* refers to the student who was observed to determine her on-task behavior during reading activities in the general education classroom but who did not experience the intervention.
Table 1. *Participant Information*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Grade</th>
<th>Gender</th>
<th>Race</th>
<th>Disability Diagnosis</th>
<th>Free/Reduced Lunch</th>
<th>Reading Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cher</td>
<td>5-9</td>
<td>K</td>
<td>Female</td>
<td>White</td>
<td>None</td>
<td>Yes</td>
<td>Beginning Kindergarten</td>
</tr>
<tr>
<td>Corwin</td>
<td>5-5</td>
<td>K</td>
<td>Male</td>
<td>White</td>
<td>Developmental Delay</td>
<td>Yes</td>
<td>Below Kindergarten</td>
</tr>
<tr>
<td>Evelyn</td>
<td>5-8</td>
<td>K</td>
<td>Female</td>
<td>White</td>
<td>None</td>
<td>Yes</td>
<td>Beginning Kindergarten</td>
</tr>
<tr>
<td>Hannah</td>
<td>5-11</td>
<td>K</td>
<td>Female</td>
<td>White</td>
<td>None</td>
<td>Yes</td>
<td>Beginning Kindergarten</td>
</tr>
<tr>
<td>Jimmy</td>
<td>5-5</td>
<td>K</td>
<td>Male</td>
<td>Black</td>
<td>None</td>
<td>Yes</td>
<td>Beginning Kindergarten</td>
</tr>
<tr>
<td>Zora</td>
<td>5-11</td>
<td>K</td>
<td>Female</td>
<td>Black/White</td>
<td>None</td>
<td>Yes</td>
<td>Beginning Kindergarten</td>
</tr>
<tr>
<td>Jacelyn*</td>
<td>5-8</td>
<td>K</td>
<td>Female</td>
<td>Black</td>
<td>None</td>
<td>Yes</td>
<td>End of Kindergarten</td>
</tr>
</tbody>
</table>

*Note: The reading level was based on the Story Town curriculum assessment conducted and reported by the classroom teacher.*

* Comparison peer.
distractible (e.g., frequently shifted focus to non-instructional stimuli). She was highly concerned with the actions of her classmates and the other adults in the classroom. Her parents stated that she was diagnosed with Attention Deficit Hyperactivity Disorder (ADHD); however, a diagnosis was not found in her school records. Throughout the school year, she missed 22.5 school days.

**Corwin.** Corwin was diagnosed with a Development Delay (speech and language delay) and attended a special needs preschool. He had a moderate articulation disorder, low-average language skills, and did not pass the Kindergarten screening test. As specified in his Individualized Education Program (IEP), he received 30 minutes of speech and language therapy once per week. According to his school records, cocaine and methamphetamines were present in his system at birth, he took medication for asthma, and had a vision rating below the normal range. He engaged in aggressive behavior (e.g., punching peers, fighting, stabbing a peer with a pencil), noncompliance (e.g., talking back to adults), and stereotypic behaviors (e.g., visually tracking the mouse and placing his hands over his eyes when looking at instructional stimuli). He was sent to in-house suspension several times and received out-of-school suspension five times throughout his participation in this study (six times during the year). During the course of the school year, he missed 37 school days.

**Evelyn.** Evelyn was diagnosed with mild asthma. At the beginning of the study, she was referred for a special education evaluation; however, she did not qualify for services. She received additional tutoring services in reading outside of school two days per week. Additionally, the teacher stated that Evelyn did not appear to comprehend language adequately or understand, or be affected by, consequences. She engaged in
disruptive behavior in the form of talking to peers, playing with clothing items, and general disengagement with instructional stimuli. During the study, she received in-school suspension several times, and out-of-school suspension three times, for behaviors such as talking back to adults, cursing, and pinching and kicking peers. During the school year, she had 41 absences.

**Hannah.** Hannah engaged in high rates of off-task behavior, required several prompts to stay on-task during classroom instruction, and often had a glazed look. Based on this information, she was evaluated for ADHD and seizures. Due to a sudden relocation, Hannah left the school and did not complete the study. At the time of her departure, she had not been diagnosed with ADHD and the neurological results had not been confirmed. She never received in-school or out-of-school suspension.

**Jimmy.** Jimmy engaged in non-compliance and became easily frustrated when corrected or when he could not do what he wanted. He engaged in disruptive behaviors in the forms of yelling, slamming materials, crying, and work refusal. Jimmy also engaged in aggressive behavior (e.g., fighting). He received in-school suspension once, out-of-school suspension once (e.g., choking a peer), and was suspended from the school bus three times throughout the year. Overall, he missed 19 school days. The classroom teacher and the counselor suspected that he might have an emotional disturbance due to his rapid mood changes; however, Jimmy had not been assessed at the time of the study. He did attend a group counseling and social skills group with the school counselor and two classmates.

**Zora.** Zora engaged in high rates of off-task behavior in the form of manipulating clothing and inanimate objects, talking with peers, general disengagement with
instructional stimuli, and work refusal. Her parents stated that she had ADHD; however, a diagnosis was not found in her school records. She took medication for asthma and received outside behavior therapy. Throughout the year, she missed 10.5 school days.

**Jacelyn.** Jacelyn, the comparison peer, was born two months early and took medication for asthma. She was one of the highest performers in the class, earned top behavior ratings, and was considered a model student by the classroom teacher. She followed directions and participated in classroom activities. Throughout the year, she missed 37 days of school, mostly due to an illness and death in the family. She was one of the few students in the class who always completed her homework, and her mother reported that she worked with her on school-related content at home.

**Setting.** On-task behavior observations occurred in the general education classroom while reading instruction was being delivered. Intervention sessions, and all reading assessments, were conducted in the school’s computer lab, the science lab, or the classroom. The computer lab had 30 desktop and laptop computers aligned around the outside walls of the room. When another class was using the computer lab, sessions were conducted using the computer in the target participants’ classroom. This computer sat on a table located across the room from where the teacher provided classroom instruction. When sessions took place within the classroom, assessments were conducted in the school’s science lab, which allowed for assessments to be conducted in a quiet environment unoccupied by others.

**Materials**

The materials included (a) AIMSweb Tests of Early Literacy Winter and Spring benchmark assessments (i.e., letter naming fluency (LNF), letter sound fluency (LSF),
phoneme segmentation fluency (PSF), and nonsense word fluency (NWF)); (b) AIMSWeb progress monitoring assessments (LSF and NWF) (see Appendix C for examples); (c) a randomized list of AIMSweb progress monitoring assessments (Appendix D); (d) the Headsprout pre- and post-assessment targets (Appendix E); (e) a computer with internet access for the Headsprout Early Reading program (www.headsprout.com; Layng, Stikeleather, & Twyman, 2006) and a mouse (see Appendix F for a lesson screen print-out example); (f) headphones; (g) a timer; (h) a Motivaider; (i) reinforcers (e.g., stickers, pencils, small candy); (j) Sprout Cards (see Appendix G for sample); (k) Sprout Stories (see Appendix H for an example); (l) laminated flashcards of instructed targets; (m) Headsprout lesson progress map (Appendix I); (n) star stickers; (o) treatment integrity checklists (Appendix J); (p) Headsprout lesson recording sheet (Appendix K); (q) the Teacher form of the Social Skills Improvement Scales (SSIS; Gresham & Elliot, 2000) (Appendix L); (r) the Woodcock Reading Mastery Test-Norm Updated Forms G and H (WRMT-NU; Woodcock, 1998); (s) the whole interval on-task data recording sheet (Appendix M); and (t) teacher, parent, and target participant social validity questionnaires (Appendix N).

**Independent Variables**

Headsprout Early Reading (www.headsprout.com; Layng, Stikeleather, & Twyman, 2006) served as the independent variable and sessions were conducted five days per week, except for school holidays and when a target participant was absent. This instruction was provided in addition to the general education classroom reading instruction.
The Headsprout program is a research-based, interactive, internet program that provides explicit reading instruction and real-time feedback based on the accuracy of the student’s responses. To successfully engage with the program, it is recommended that students have the language skills of a typical four-year-old, the ability to move and click the mouse, and an understanding of words such as “first,” “next,” “last,” and “not” (Twyman, Stikeleather, Layng, & Hobbins, 2003). The program is divided into two parts consisting of 40 lessons each, for a total of 80 lessons. The student moves through the lessons at his or her own pace with built-in assessments and progress reports. The program provides specific target skills and guides students through each lesson. A typical lesson will provide instruction on letter-sound correspondence, segmenting and blending decodable words, sight words, and sentence or passage reading (see Appendix F for lesson examples). Throughout each lesson, the student participates in animated games and activities in which correct responses move a character from one location to the next on the screen (e.g., for each correct response the student makes, the character jumps to the next lily pad until the character reaches the shore). If the student makes an error, the program provides immediate corrective feedback and additional practice of that skill. If multiple errors are made, instruction on the skill is re-presented. Following the completion of each lesson, a progress report is produced containing the following measures: the number of correct and incorrect responses made (i.e., percent correct), the cumulative time the child has spent in the program, and the total number of responses made (i.e., mouse clicks) thus far in the program.

**Sprout Cards.** Pre-printed Sprout Cards (see Appendix G) provided by Headsprout Early Reading (Layng, et al., 2006) were utilized to provide supplemental
instruction, if necessary. Each set of Sprout Cards consisted of those targets (i.e., sound elements and words) instructed through designated lessons: Sprout Card set one consisted of targets instructed during lessons 1-5 (10 total targets); set two consisted of targets instructed during lessons 6-11 (19 total targets); set three consisted of targets instructed during lessons 12-18 (20 total targets); set four consisted of targets instructed during lessons 19-23 (10 total targets); set five consisted of targets instructed during lessons 24-30 (17 total targets); and set six consisted of targets instructed during lessons 31-40 (22 total targets). Each target was printed in black Verdana font on the front side of each card.

**Sprout Stories.** Pre-printed Sprout Stories provided by Headsprout Early Reading (Layng et al., 2006) were utilized following designated lessons (e.g., after lesson 5, 11, etc.). Three types of stories were provided: *Headsprout readers, read with me stories,* and *companion stories* (see Appendix H for examples). The six *Headsprout readers* consisted of targets instructed and practiced during the designated online lesson. Each of these stories was practiced during a Headsprout lesson. The eight *read with me stories* contained readable text (bolded font) for the target participants and more difficult text (regular font) to be read by a more skilled reader. The researcher read the more difficult text. The 16 *companion stories* were stories not directly taught during the online lessons; however, each story contained words directly taught during the program and novel words comprised of instructed letter sounds and words.

**Dependent Variables**

The dependent variables for this study were the (a) frequency of correct and incorrect responses on AIMSweb TEL, (b) percent correct of responses on the researcher-
developed curriculum-based measure (CBM), and (c) percentage of intervals on-task during classroom reading instruction observations. Additionally, treatment integrity, interobserver agreement, and social validity data were collected.

**Pre-assessments and post-assessments.** The AIMSweb TEL benchmark assessments (i.e., Letter Naming Fluency [LNF], Letter Sound Fluency [LSF], Phoneme Segmentation Fluency [PSF], and Nonsense Word Fluency [NWF]) were administered prior to and following intervention. The Winter Benchmarks were used prior to the intervention and the Spring Benchmarks were used at the conclusion of the intervention. Additionally, at the beginning and at the end of the study, participants were given an assessment comprised of those targets instructed during Headsprout lessons 1-40. The assessment included a total of 34 sound elements and 72 words (Appendix E). The classroom teacher completed the teacher’s form of the SSIS (Gresham & Elliot, 2000; Appendix L). Each assessment was completed for all seven participants (i.e., six target participants and one comparison participant). Finally, the WRMT-NU (Woodcock, 1998) was administered as a post-test only.

**Headsprout probes (CBM).** The instructional targets from Headsprout lessons 1-40 were divided into three sets, which represented the three experimental tiers (see experimental design). Set 1, lessons 1-11, consisted of 29 targets (i.e., Tier 1); Set 2, lessons 12-23, consisted of 29 targets (i.e., Tier 2); and Set 3, lessons 24-40, consisted of 33 targets (i.e., Tier 3). A list of the specific targets for each set can be found in Table 2. The targets were selected from the scope and sequence provided by Headsprout (i.e., the lesson in which each target was introduced and reviewed) and from the Sprout Cards provided for each group of lessons. To be included in a set, the target had to contain one
or more sound elements newly instructed during the sets corresponding lessons (e.g., Set 3 introduces /h/ and one of the words in Set 3 is hand). Each target, either a sound element or a word, was printed in 12-point Verdana font on a 3.5 inch X 5 inch white flashcard in black ink and each flashcard was laminated.

**Progress monitoring.** The AIMSweb TEL LSF and NWF progress monitoring assessments were utilized. The materials were downloaded and printed from (https://aimsweb.pearson.com). The progress monitoring assessments were presented in a randomized order. Using the website, www.random.org, probe numbers 4-33 were listed in numerical order and the website randomized the list (see Appendix D).

Table 2. *Headsprout Instructional Targets*

<table>
<thead>
<tr>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
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<td>pout</td>
<td>old</td>
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<tr>
<td>r</td>
<td>pr</td>
<td>plant</td>
</tr>
</tbody>
</table>

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|      | should |
|      | sh     | er     |
|      | st     |
|      | sheep  | Fling  |
|      | standing|
|      | fling  | sw     |
|      | folds  | sweep  |
|      | h      | sweet  |
|      | sleeps |
|      | hands  |
|      | T      |
|      | he     |
|      | t      |
|      | her    |
|      | tr     |
|      | his    |
|      | Trish  |
|      | holds  |
|      | wing   |
|      | is     |
|      | wings  |
|      | old    |
|      | would  |
**On-task behavior.** Levels of on-task behavior (e.g., looking at instructional material, making appropriate responses to instructional material, looking at the individual providing instruction, following directions) were measured during reading instruction within the participants’ classroom. The percentage of the observation time that the participant engaged in on-task behavior was assessed using five-second whole-interval recording procedures, across a five-minute observation period. Whole-interval recording is a measurement method in which the presence or absence of the target behavior is recorded during a specified interval (Cooper, Heron, & Heward, 2007), in this case five seconds. Therefore, the student must engage in the target behavior (i.e., on-task behavior) for the entire duration of the five-second interval for the presence of the behavior to be recorded. If the student did not engage in on-task behavior for the entire duration of the five-second interval, the absence of the behavior was recorded (i.e. off-task behavior). At the end of each five-second interval, the experimenter recorded whether the participant was on-task or off-task. There were 60 intervals in the 5-minute observation period. A description of the off-task or disruptive behavior the participants engaged in during the five-second interval was noted (e.g., playing with shoes, talking to a peer, looking at something other than instructional material or teacher).

Each observation session consisted of one five-minute period when the classroom teacher was providing prereading or reading instruction. A five-minute observation period was selected to ensure that all observations could be conducted within the allotted timeframe (i.e., time constraints). All data were recorded using the whole-interval recording data sheet (Appendix M). The primary researcher conducted the on-task observations during the baseline condition. However, once a target participant entered the
intervention condition, a secondary data collector (not the researcher) conducted the on-task observations. This data collector had experience in collecting whole-interval recording data and was trained by the primary researcher. Each step to be completed during an observation, along with the definition of off-task and on-task behavior, was explained prior to collecting whole-interval data. The training mastery criterion was set at 90% agreement of the intervals recorded across three observations. These observations were conducted with different participants and the criterion was met after one training session.

**Experimental Design**

A combination of a multiple probe design across Headsprout targets (i.e., three tiers) with a multiple probe design across participants (i.e., four tiers) was utilized to assess the effects of the supplemental reading instruction on reading skills and on-task behavior of kindergarten students with concomitant reading and behavior difficulties.

**Procedures**

For all reading-related variables, correct responses were defined as vocal responses that matched the presented written or spoken stimulus, including self-corrections made within three seconds of the initial incorrect response. Incorrect responses were defined as vocal responses that did not match the presented written or vocal stimulus, omitted words or sounds, and self-corrections occurring more than three seconds after the initial response.

**Pre-assessment.** Pre-assessments included (a) The AIMSweb TEL Winter benchmark assessments (Good & Kaminski, 2007), (b) the researcher-developed Headsprout assessments (i.e., contained targets from lessons 1-40; Appendix E), and (c)
the teacher’s form of the SSIS (Gresham & Elliot, 2000; Appendix L). These assessments were conducted individually prior to intervention with all participants (i.e., the target participants and the comparison peer).

**Benchmark assessments.** The AIMSweb TEL benchmark assessments (i.e., LNF, LSF, PSF, and NWF) were conducted individually for each participant. The protocols provided by AIMSweb (http://aimsweb.pearson.com) were followed for all benchmark assessments. Each subtest consisted of a single one-minute timing and the procedures for each benchmark assessment set was equivalent. On the LNF and LSF subtests, letters are presented in a randomized order in rows of 10, with uppercase and lowercase letters in each row, and students say aloud the names (i.e., LNF subtest), or the corresponding sound (i.e., the NSF subtest), of as many letters as possible for 1 minute. The PSF subtest assesses phonological awareness skills and asks the student to name each phoneme he or she hears in a presented word (e.g., /c/ /a/ /t/ for the word *cat*). The NWF subtest consists of nonsense words (each word follows a consonant-vowel-consonant pattern) presented in rows of 10 and the student can either say each sound in the word (e.g., l-a-t) or read the entire word (e.g., *lat*). The frequency of correct and incorrect responses per minute were recorded, with the exception of the PSF assessment in which only correct phonemes were recorded.

**Headsprout pre-assessment.** The researcher-developed Headsprout pre-assessment consisted of the 34 sound elements (i.e., letter sound(s) or word part) and the 72 words introduced in lessons 1-40. The assessment was placed in front of the participant and the researcher pointed to each individual target and asked the participant to say the sound (or the word). The participant was told that if he or she did not know the
sound (or word) to say so and the researcher moved to the next target. If the participant did not respond within three seconds, he or she was prompted to respond (e.g., “What’s this sound?”). The researcher did not provide performance-based feedback. The total number of correct responses was noted and a percent correct was calculated and recorded. Additionally, for those participants who did not complete all 40 Headsprout lessons, a percentage of the instructed targets responded to correctly was also calculated. For example, if a student was only instructed on 30 of the 41 sounds, only responses to those 30 sounds were included in this calculation.

**Social Skills Improvement Scale (SSIS).** The classroom teacher completed the teacher’s form of the SSIS (Gresham & Elliot, 2000) for all seven participants. The researcher reviewed the directions with the classroom teacher and then instructed the teacher to answer each of the questions by circling the corresponding rating for each question. The researcher scored each of the assessments using the protocols in the SSIS manual.

**Baseline.** Baseline measures were collected on the (a) AIMSweb TEL LSF and NWF progress monitoring assessments, (b) researcher-produced CBM (i.e., Headsprout probes), and (c) levels of on-task behavior. A minimum of three baseline measures were collected for each assessment.

**Progress monitoring.** The AIMSweb protocols were utilized for all AIMSweb TEL LSF and NWF progress monitoring assessments (i.e., standardized directions, a 1-minute timing was conducted, and standardized scoring protocols). The frequency of correct and incorrect responses were calculated and graphed. The progress monitoring
probes were presented in a randomized order and at least three progress monitoring probes were conducted during the baseline phase.

**Headsprout probes.** During baseline, the researcher-produced CBM’s (i.e., flashcards containing targets from the assigned lessons) were administered for all three sets (i.e., tiers). Therefore, during each baseline session, the Set 1 probe, the Set 2 probe, and the Set 3 probe were administered individually, for a total of three timings (one timing per set/ tier). The number of correct and incorrect responses were recorded to calculate the accuracy of each probe (i.e., percent correct).

For each probe, the researcher instructed the participant to “read the word when you see a word and say the sound when you see the letter(s).” The researcher would hold up a flashcard with either a word or letter(s) (e.g., /t/, /ch/, *swing*) on it for the participant to read. After the participant made a response, the next flashcard was presented until the participant had responded to all of the flashcards for that set (i.e., 29 flashcards for Set 1 and Set 2, and 33 flashcards for Set 3). The researcher provided neutral feedback (e.g., “you are really working hard”) for completing the entire deck; however, corrective feedback was not provided, and commenting on the participant’s performance accuracy did not occur. If the participant was off-task for three or more seconds, the researcher prompted him or her to keep going and the off-task prompt was noted. Those targets the participant responded to correctly were noted and the percent correct was calculated (i.e., the number of correct responses divided by the total number of targets).

**On-task behavior.** Levels of on-task behavior of the participants were assessed during a five-minute general education observation period involving reading instruction using whole-interval recording of five-second intervals. At least three five-minute
observational sessions were conducted prior to each target participant entering the intervention phase. Three five-minute sessions were observed for the comparison peer as well. During these observations, both the primary observer, and secondary observer when present, sat in a location within the classroom with a clear view of the participant whose behavior was being observed. The Motivaider was set to vibrate every five seconds and it was set to run at the beginning of the five-minute observation period. Observers independently watched the participant for the entire five-minute observation period. If the participant engaged in any off-task behavior during the interval, the observer placed an “x” in its corresponding box on the data sheet. If the participant was on-task for the entire five-second interval, the observer placed a checkmark (√) in the corresponding box on the data sheet. Observers did not interact with the participants or react to the participants’ behavior, and avoided eye contact with participants during observations. If at any point during the observation period instruction was not provided for 30 consecutive seconds, the Motivaider was paused. Once instruction resumed, the Motivaider was restarted and data were collected for the remainder of that observation period. At the end of the observation period, the observer calculated the total percentage of time on task. The percentage of time spent on task was calculated by dividing the total number of intervals marked as on-task by the total number of intervals in the five-minute observation period (i.e., 60). This percentage was recorded on the data sheet.

**Intervention.** The six target participants entered intervention in a staggered fashion (i.e., four tiers). Following baseline, Zora, Cher, and Corwin began the intervention phase (i.e., Tier 1 of participants) while the other three target participants remained in baseline. When Zora completed Headsprout lesson 11 and had demonstrated
an increasing trend on the researcher-developed CBM (i.e., Headsprout probe) for that set of targets (i.e., Tier 1 of Headsprout targets), Jimmy entered the intervention phase (i.e., the second tier of participants), while the other two target participants remained in baseline. When Jimmy demonstrated stability, Hannah entered the intervention phase (i.e., Tier 3 of participants) while the last target participant remained in baseline. When Hannah demonstrated performance stability, Evelyn entered the intervention phase (i.e., Tier 4 of participants).

All instructional sessions occurred in the computer lab or the target participants’ classroom. Instructional sessions occurred five days per week. Feedback regarding the target participant’s non-academic behavior was minimized but social praise for focusing during instruction and following directions was provided if needed (e.g., the child engaged in high levels of off-task behavior during the tutoring session). If the target participant was off task for more than three seconds, the researcher provided a prompt to keep working. Additionally, the researcher provided clarification of directions and corrective instructional feedback, if necessary. For example, if the target participant made an incorrect response to a sound, the researcher provided the correct sound and instructed the target participant to repeat the sound. The delivery of such prompts was recorded and tracked over time. Additionally, the target participant earned small rewards (e.g., stickers and pencils) based on academic performance.

Each target participant sat at a table in front of the computer with the Headsprout Early Reading program downloaded on it. Headphones were worn if the session took place in the classroom or if other students were present in the computer lab. The researcher told the participant, “to follow the directions of the computer and to ask for
help if needed.” The target participant completed one Headsprout lesson per session; however, if the target participant completed a lesson in less than 15 minutes, he or she was given the choice to complete a second Headsprout lesson. No more than two lessons were completed during a single session and each session lasted approximately 30 minutes. Target participants completed a Headsprout reader, a companion story, and a read with me story as designated by the Headsprout Early Reading Program (e.g., the first Headsprout reader was read after lesson 5, the first read with me story after lesson 12, and the first companion story after lesson 15). The target participant was instructed, “to read the story as best as he or she could” for all stories. The target participant was prompted to sound out the decodable words and the researcher utilized an error correction procedure consisting of the Model-Lead-Test format. Following the completion of each Headsprout lesson, the target participant placed a sticker on the completed lesson’s number, and each Headsprout reader as applicable, on the Headsprout progress map (Appendix I).

**Headsprout probes.** For the target participants in the intervention phase, the corresponding probe (i.e., Set 1, 2, or 3) was conducted following the completion of every odd-numbered lesson for Set 1 (e.g., lessons 1, 3, 5, etc.; Headsprout targets Tier 1) and after the completion of every even-numbered lesson for Set 2 and Set 3 (e.g., lessons 12, 14, 24, 26, etc.; Headsprout targets Tier 2 and Tier 3). For those target participants still under baseline conditions, probes were conducted (i.e., Tier 1, 2, and 3) following the completion of the first lesson by the target participant in the preceding tier and at least two other times prior to entering the intervention condition. For example, when Zora,
Cher, and Corwin completed lesson 1, Jimmy, Hannah and Evelyn also completed all probes.

**Supplemental instruction.** If the target participant did not demonstrate at least 80% accuracy on the probe following lesson 5, 11, 18, 23, 30, or 40, supplemental instruction using the program-provided Sprout Cards was provided. Each of these probes had a different criterion to determine the need for supplemental instruction based on the number of targets instructed up to that point in the program (see Table 3). For example, for Set 1 (i.e., Tier 1 for Headsprout Targets), after the completion of lesson 5, the target participant was expected to respond correctly to 10 of the 29 targets. If the target participant did not respond correctly to at least 8 of the 10 instructed targets, the supplemental instruction using Sprout Cards was implemented. The Headsprout program provided these cards and each flashcard contained one target instructed during the lessons completed up to that point (e.g., 10 flashcards after lesson 5).

Table 3. *Sprout Card Instruction Mastery Criterion*

<table>
<thead>
<tr>
<th>Headsprout Lesson</th>
<th>Sprout Card Targets</th>
<th>Headsprout Probe Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>10</td>
<td>8 / 10 = 80%</td>
</tr>
<tr>
<td>11</td>
<td>19</td>
<td>16 / 19 = 84%</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td>16 / 20 = 80%</td>
</tr>
<tr>
<td>23</td>
<td>9</td>
<td>8 / 9 = 89%</td>
</tr>
<tr>
<td>30</td>
<td>17</td>
<td>14 / 17 = 82%</td>
</tr>
<tr>
<td>40</td>
<td>19</td>
<td>16 / 19 = 84%</td>
</tr>
</tbody>
</table>
During this instruction, the pre-printed Sprout Cards (Appendix G) were presented one at a time and the target participant was instructed to “remember to sound out the words and say the sounds when you see the letter(s).” If the target participant made a correct response, the researcher provided positive feedback, set the flashcard on the table, and presented the next flashcard. If the target participant made an incorrect response or did not make a response within three seconds, the researcher provided the correct response (model), the target participant repeated the correct response with the researcher (lead), then the target participant repeated the correct response independently (test). The flashcard was then placed back in the pile and represented after one or two other flashcards. These steps were repeated until the target participant had responded correctly to all of the flashcards in the absence of a prompt. This process was repeated three times, with the cards being shuffled between each presentation.

Following the three trials, a probe was conducted on those targets only. The same flashcards used during the Headsprout probes (CBM) were utilized for these probes; however, only the instructed targets were assessed (e.g., 10 flashcards for Sprout Card set 1 probe). The target participant was instructed to “say the word when you see a word and say the sound when you see the letter(s).” If the target participant said that he or she did not know the word, the researcher prompted him or her to sound out the word; however, instructional feedback, or feedback regarding the correctness of the responses, was not provided.

If the target participant responded to any of the targets incorrectly during the probe, additional instruction using the Sprout Cards, those flashcards provided by
Headsprout) was provided. This post-probe, additional instruction consisted of the model-lead-test procedure described above (i.e., one trial per target) and was only provided for those targets the target participant had responded to incorrectly during the probe. The flashcards utilized to conduct probes (i.e., laminated flashcards) were never used during instructional trials; rather, all instructional trials were provided using the Sprout Cards. This supplemental instruction was provided until the participant reached the designated criterion (i.e., at least 80% accuracy during the post-instruction probe). Only one probe was conducted per session.

**Progress monitoring.** AIMSweb TEL LSF and NWF progress monitoring assessments were administered after the completion of the last lesson of each tier (i.e., lessons 11, 23, and 40). If supplemental Sprout Card instruction was provided after lesson 11, 23, or 40, the AIMSweb assessments were conducted following the completion of such instruction, but prior to the completion of the next lesson (i.e., lesson 12 or 24). Additionally, if the target participant did not complete lesson 40, the progress monitoring probes were conducted following the last completed lesson (e.g., lesson 38).

**On-task behavior.** Three on-task observations occurred for each target participant during each tier. The on-task observations occurred after the completion of lessons 4, 8, and 11 during Tier 1; lessons 15, 19, and 23 during Tier 2; and lessons 28, 34, and 40 during Tier 3. If the target participant did not complete all Headsprout lessons, an on-task observation occurred after the last completed lesson. On-task observations were conducted once every four weeks for the comparison peer. The procedures utilized during these observations were identical to those described under the baseline condition.
**Post-assessment.** Following intervention, post-assessments included the (a) AIMSweb TEL Spring benchmark assessments (Good & Kaminski, 2007); (b) researcher-developed Headsprout assessments (i.e., contained all targets from lessons 1-40) (Appendix E); (c) teacher’s form of the SSIS (Gresham & Elliot, 2000) (Appendix L); and (d) Woodcock Reading Mastery Test-Norm Update (WRMT-NU) Word Identification and Word Attack assessments. All assessments were conducted with all seven participants and followed the same procedures as those described during the pre-assessment phase.

**Interobserver Agreement and Treatment Integrity**

**Interobserver agreement.** A second observer collected interobserver agreement (IOA) data on the reading assessments, probes, and engagement in on-task behavior during each phase of the study and for each participant. An exact agreement percentage was calculated separately for each assessment. To determine a point-by-point agreement for all reading-related dependent variables (e.g., CBM probes), the number of individual targets (i.e., sounds and words) that both the first and second observers recorded as either correct or incorrect was calculated. To determine a trial-by-trial agreement, the number of intervals during the on-task observations that both the first and second observers recorded as either on-task or off-task (i.e., total number of trials of agreement divided by the number of trials of agreements plus disagreements multiplied by 100) was calculated.

A second observer scored 100% of the pre-assessments and 85% of the post-assessments for all participants, except for the SSIS, which was only completed by the classroom teacher. Across the four subtests of the Winter and Spring benchmark assessments, 96% and 97% agreement was found, respectively. Across the Headsprout
sound pre-and post-assessments, 98% and 100% agreement was found. Across the Headsprout word pre-and post-assessments, 99.9% and 99% agreement were found, respectively. For the WRMT-NU assessments, 98% agreement was found. IOA was conducted for 41% of the Headsprout probes with 99% agreement, distributed across participants and tiers. IOA was conducted for 68% of the on-task observations with 94% agreement, distributed across participants and conditions. For IOA calculations for each participant, see Table 4.

**Treatment integrity.** The secondary observer was a first year doctoral student and had completed a course in single-subject research methodology. The observer was trained on how to complete the treatment integrity checklists and data collection began after the observers reached 100% agreement for 3 consecutive sessions. Additionally, the observer was trained on how to define a correct response, an incorrect response, and on- and off-task behavior, as well as, how to conduct whole-interval recordings.

Treatment integrity was defined as the total number of steps completed by the researcher during each lesson, probe, or assessment. The treatment integrity checklist provided by AIMSweb (https://aimsweb.pearson.com) was utilized for all benchmark and progress monitoring assessments. The primary researcher created a checklist containing the necessary steps for the Headsprout lessons, the Headsprout probes, and the on-task behavior observations (see Appendix J). Using the appropriate checklist, a second observer placed a checkmark next to the corresponding step if it was completed during the session and an “x” if the step was not completed. The total number of steps divided by the number of completed steps yielded the treatment integrity percentage for that lesson or observation.
Table 4. *Interobserver Agreement Levels for Dependent Variables*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Headsprout % of Probes</th>
<th>Headsprout Agreement Levels</th>
<th>Headsprout Range</th>
<th>On-Task % of Probes</th>
<th>Agreement Levels</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cher</td>
<td>46%</td>
<td>99.5%</td>
<td>88-100%</td>
<td>50%</td>
<td>93%</td>
<td>75-100%</td>
</tr>
<tr>
<td>Corwin</td>
<td>50%</td>
<td>99%</td>
<td>82-100%</td>
<td>67%</td>
<td>92%</td>
<td>85-100%</td>
</tr>
<tr>
<td>Evelyn</td>
<td>17%</td>
<td>100%</td>
<td>100-100%</td>
<td>63%</td>
<td>98%</td>
<td>97-100%</td>
</tr>
<tr>
<td>Hannah</td>
<td>54%</td>
<td>99%</td>
<td>91-100%</td>
<td>33%</td>
<td>93%</td>
<td>90-95%</td>
</tr>
<tr>
<td>Jacelyn*</td>
<td>40%</td>
<td>97%</td>
<td>95-98%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jimmy</td>
<td>33%</td>
<td>98%</td>
<td>88-100%</td>
<td>38%</td>
<td>95%</td>
<td>85-100%</td>
</tr>
<tr>
<td>Zora</td>
<td>41%</td>
<td>97%</td>
<td>80-100%</td>
<td>33%</td>
<td>93%</td>
<td>78-100%</td>
</tr>
</tbody>
</table>

*Comparison peer.

Treatment integrity was checked by a second observer for 100% of the pre-assessments, 85% of the post-assessments, and 68% of the on-task observations. During each observation, the researcher completed 100% of the steps. Treatment integrity was checked for 43% of the Headsprout lessons and 40% of the Headsprout probes, distributed across participants and tiers. Across all of the lessons, the researcher completed 99.7% of the steps. On two occasions a target participant prompted the
researcher to place a sticker on the Headsprout progress map. The researcher completed 100% of the steps for all Headsprout probes. More comprehensive treatment integrity data can be found in Table 5.

Table 5. Treatment Integrity Levels for Dependent Variables

<table>
<thead>
<tr>
<th>Participant</th>
<th>Headsprout</th>
<th>On-Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Lessons</td>
<td>Steps Completed</td>
</tr>
<tr>
<td>Cher</td>
<td>53%</td>
<td>99%</td>
</tr>
<tr>
<td>Corwin</td>
<td>52%</td>
<td>100%</td>
</tr>
<tr>
<td>Evelyn</td>
<td>44%</td>
<td>100%</td>
</tr>
<tr>
<td>Hannah</td>
<td>39%</td>
<td>100%</td>
</tr>
<tr>
<td>Jimmy</td>
<td>39%</td>
<td>99%</td>
</tr>
<tr>
<td>Zora</td>
<td>36%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: The percentage of steps completed was calculated based on the total number of steps possible for all lessons or probes.

Social Validity

Social validity questionnaires were given to the classroom teacher, each target participant, and to the caregiver of each target participant (see Appendix N). Following intervention, a social validity questionnaire was given to assess the teacher's overall
perceptions regarding the effects of the intervention on each target participants’ reading skills and behavior during classroom reading instruction. Social validity questionnaires were given to each parent following intervention to assess his or her overall perceptions of his or her son or daughter’s reading skills and at-home behavior following the start of the study. Additionally, whether the student engaged in reading behavior in the absence of prompts, such as reading for fun or sounding words out more frequently, was assessed using these questionnaires. Finally, each target participant was given a simple questionnaire to assess his or her overall satisfaction with the program.
Chapter 4: Results

In this chapter, a review of each of the following dependent measures is presented, followed by each participant’s performance on these measures: Headsprout lessons, Headsprout stories, supplemental instruction (Sprout Cards), the researcher-developed CBM (Headsprout probes), progress monitoring assessments, on-task observations, and all pre- and post-assessments. The data are organized by this study’s research questions.

The Headsprout program recorded the lesson completion time, the accuracy of responses, as well as the total number of responses made (i.e., mouse clicks) per lesson for each participant. Following designated lessons (i.e., lessons 5, 11, 18, 23, 30, and 40), the Headsprout readers, which were identical to the story read during the lesson, were read by the target participant to the researcher. The number of words read correctly divided by the total number of words in the story was calculated to determine the percent correct for each story. Supplemental instruction was provided using Sprout Cards if the target participant did not reach the 80% mastery criterion on specified probes (i.e., lessons 5, 11, 18, 23, 30, and 40). The data presented here are the number of correct responses made divided by the total number of responses possible for each Sprout Card set. The majority of the data discussed are those pertaining to the Headsprout probes for Sets 1, 2, and 3 (i.e., Tiers 1, 2, and 3). Progress monitoring consisted of the AIMSWeb
Letter Sound Fluency (LSF) and Nonsense Word Fluency (NWF) assessments and the frequency of correct and incorrect responses are presented for each assessment. Progress monitoring assessments were given at the end of each tier (i.e., after lesson 11, 23, and 40). If the target participant did not complete all 40 lessons, progress monitoring probes were conducted after the last completed lesson. The percentage of intervals spent on-task was calculated based on five-minute observations using five-second whole-interval recordings.

The Effects of the Headsprout Early Reading Program on Reading Achievement

To assess the effects of Headsprout Early Reading (www.headsprout.com), a multiple baseline across participants as well as across Headsprout lessons (targets) was utilized. The target participants’ performance on Headsprout probes displayed within a multiple baseline design across participants is shown in Figure 1. Overall, an increase in performance was seen when, and only when, the intervention was applied to each Tier while the other tiers in baseline remained low and stable; therefore, experimental control was demonstrated.

The following measures were assessed and the results are presented below for each target participant: lesson specific information; the performance accuracy for each story, Sprout Card probe, and Headsprout probes for Tiers 1, 2, and 3 (i.e., Sets 1, 2, and 3); and progress monitoring LSF and NWF assessments.

Cher. Cher completed all 40 lessons. The duration of her lessons ranged from 8 minutes (lesson 1) to 31 minutes (lesson 35), with an average of 18 minutes, and a median of 17 minutes. Overall, she spent 12 hours and 34 minutes engaged with the
Figure 1. Results for Headsprout Probes Across Targets and Participants.

*Note.* This graph depicts performance on those targets during the intervention phase as well as those targets that remained in the baseline phase.
program, making a total of 7,909 responses. Her overall accuracy (total number of correct responses divided by the total number of responses made) was 93.13% accuracy, with a low of 75.53% (lesson 10) and a high of 100% (lessons 3, 7, 18, and 19). Cher repeated lesson 6 after returning from an extended absence of more than a week.

**Headsprout stories.** Cher read the Headsprout readers 3 (following lesson 18), 5 (lesson 30), and 6 (lesson 40) with 100% accuracy and 1 (lesson 5), 2 (lesson 11), and 4 (lesson 23), with 86%, 92%, and 92% accuracy, respectively. For each of these stories, she made one error.

**Headsprout probes.** Cher’s results are shown in Figure 2. The data for baseline, intervention, and maintenance conditions are shown.

**Baseline.** During baseline, a decreasing trend was demonstrated in Tier 1, with a mean percentage of accurate responding of 16% with a range of 3% to 31%. Tier 2 baseline data remained low and stable with a mean percentage of 5% and a range of 3% to 7%. Tier 3 showed some variability, although a steady state of responding was demonstrated with a mean percentage of 10% and a range of 3% to 15%.

**Intervention.** Following intervention for Tier 1, there was a steady increase in accurate responding throughout the tier. The mean percentage of accurate responding was 35% with a range of 17% to 52%. A percentage of non-overlapping data points (PND) of only 50% was demonstrated and consisted of the last three data points for this condition. During the intervention phase in Tier 2, an immediate increase in accuracy was demonstrated, followed by a localized decreasing trend for the first four probes, and then an increasing trend for the last three probes. The mean percentage during this condition was 23% with a range of 14% to 45%. Overall, an increasing trend was demonstrated
with a PND of 100%. During the intervention phase in Tier 3, a localized decreasing trend was demonstrated for the first three probes; however, an increasing trend overall was found. The mean percentage was 44% with a range of 18% to 91%. Additionally, a PND of 100% was demonstrated. Generally, an increase in performance was seen when, and only when, the intervention was applied to each Tier while the other tiers in baseline remained low and stable; therefore, experimental control was demonstrated.

Mainteance. During Tier 1, the maintenance probes occurred immediately following intervention, 4 weeks following intervention, and 7 weeks following intervention. For Tier 2, the maintenance probe was conducted 3 weeks following the end of intervention. Maintenance data were not collected for Tier 3 due to the school year ending. In all cases, maintenance data were higher than those obtained during the intervention phase. Specifically, Cher’s maintenance scores were 100%, 69%, and 100% for Tier 1 and 86% for Tier 2.

Sprout cards. Cher’s results on Sprout Card probes are also shown in Figure 2. Based on Cher’s performance on the Headsprout probes, supplemental instruction using Sprout Cards was necessary following lessons 5, 11, 18, 23, and 30. The only Sprout Card set not utilized was set 6 (lesson 40). After Cher received instruction on set 1, she responded to 5 of the 10 targets correctly, performing with 50% accuracy, which was below the 80% mastery criterion. Therefore, additional instruction was provided. She then correctly responded to 10 of the 10 targets on the second probe. After instruction on set 2, Cher responded to 12 of the 19 targets correctly (63%); therefore, instruction was provided a second time and she responded to 16 of the 19 targets correctly (84%) during the Sprout Card probe. Instruction was provided only once for sets 3, 4, and 5 in which
Figure 2. Cher’s Headsprout Probe Results.
she correctly responded to 18 of 20 (90%), 8 of 9 (89%), and 17 of 17 (100%) targets for each probe, respectively.

**Progress monitoring.** Cher completed the AIMSWeb LSF and NWF progress monitoring assessments during baseline and at the end of each tier (i.e., after lesson 11, 23, and 40). Results for each LSF and NWF progress monitoring probes are shown in Table 6 and Table 7, respectively.

During baseline, Cher completed four LSF and three NWF progress monitoring assessments. On the LSF assessment, she demonstrated a mean of 16 correct responses and 5 incorrect responses. Her correct responses ranged from 14 to 16 responses per minute and her incorrect responses ranged from 3 to 9 responses per minute. On the NWF assessment, Cher demonstrated a mean of 10 correct sounds per minute and 7 incorrect sounds per minute. Her correct responses ranged from 7 to 13 sounds per minute and her incorrect responses ranged from 5 to 8 sounds per minute. During intervention, Cher’s mean performance on LSF improved to 35 correct and 0 incorrect responses, with a range of 29 to 45 correct responses and 0 to 1 incorrect responses. Her mean performance on NWF improved to 25 correct sounds and 1 incorrect sound, with a range of 19 to 30 correct sounds and 0 to 1 incorrect sounds per minute.

**Zora.** Zora completed 36 lessons. The duration of her lessons ranged from 9 minutes (lesson 1) to 38 minutes (lesson 22), with an average of 22 minutes, and a median of 21 minutes. Overall, she spent 14 hours and 14 minutes engaged with the program, making a total of 7,990 responses. She demonstrated an overall accuracy of 89.07%, with a low of 69.59% (lesson 14) and a high of 98.38% (lessons 18). Due to a high error rate on the first attempt, Zora repeated lesson 11 a second time. Additionally,
Table 6. *Target Participant Letter Sound Fluency Progress Monitoring Assessment Results*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cher CSPM</th>
<th>Cher %</th>
<th>Zera CSPM</th>
<th>Zera %</th>
<th>Corwin CSPM</th>
<th>Corwin %</th>
<th>Jimmy CSPM</th>
<th>Jimmy %</th>
<th>Hannah CSPM</th>
<th>Hannah %</th>
<th>Evelyn CSPM</th>
<th>Evelyn %</th>
<th>Group CSPM</th>
<th>Group %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>14 82%</td>
<td>2 20%</td>
<td>10 59%</td>
<td></td>
<td>25 83%</td>
<td></td>
<td>15 75%</td>
<td></td>
<td>9 60%</td>
<td></td>
<td>15 61%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>16 85%</td>
<td>2 14%</td>
<td>12 60%</td>
<td></td>
<td>30 88%</td>
<td></td>
<td>28 90%</td>
<td></td>
<td>6 75%</td>
<td></td>
<td>4 36%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 87%</td>
<td>9 50%</td>
<td>6 43%</td>
<td></td>
<td>41 93%</td>
<td></td>
<td>19 61%</td>
<td></td>
<td>4 36%</td>
<td></td>
<td>0 0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 62%</td>
<td>12 50%</td>
<td>14 58%</td>
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<td>19 90%</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>6 46%</td>
<td>10 43%</td>
<td></td>
<td></td>
<td>30 81%</td>
<td></td>
<td>22 55%</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15 75%</td>
<td></td>
<td>33 69%</td>
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<td>26 59%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1</td>
<td>29 97%</td>
<td>12 55%</td>
<td>8 67%</td>
<td></td>
<td>33 92%</td>
<td></td>
<td>23 100%</td>
<td></td>
<td>21 82%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 2</td>
<td>45 100%</td>
<td>13 59%</td>
<td>13 62%</td>
<td></td>
<td>46 90%</td>
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<td></td>
<td></td>
<td>29 78%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Tier 3</td>
<td>31 100%</td>
<td>13 54%</td>
<td></td>
<td></td>
<td>39 95%</td>
<td></td>
<td></td>
<td></td>
<td>28 83%</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Notes. CSPM=Correct Sounds Per Minute; %=the percent correct of total responses made during the 1-minute timing; the blank cells are due to assessments not being conducted.

Data represent average performance for each condition.*
Table 7. Target Participant Nonsense Word Fluency Progress Monitoring Assessment Results

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cher</th>
<th>Zora</th>
<th>Corwin</th>
<th>Jimmy</th>
<th>Hannah</th>
<th>Evelyn</th>
<th>Group¹</th>
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<tr>
<td></td>
<td>Cspm</td>
<td>%</td>
<td>Cspm</td>
<td>%</td>
<td>Cspm</td>
<td>%</td>
<td>Cspm</td>
</tr>
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<tr>
<td></td>
<td>9</td>
<td>64%</td>
<td>9</td>
<td>45%</td>
<td>19</td>
<td>61%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>47%</td>
<td>11</td>
<td>61%</td>
<td>0</td>
<td>0%</td>
<td>12</td>
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<tr>
<td></td>
<td></td>
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<td>10</td>
<td>67%</td>
<td>10</td>
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<td></td>
<td></td>
<td></td>
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<td>0%</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1</td>
<td>19</td>
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<td>7</td>
<td>100%</td>
<td>11</td>
<td>65%</td>
<td>8</td>
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<tr>
<td>Tier 2</td>
<td>30</td>
<td>97%</td>
<td>6</td>
<td>55%</td>
<td>14</td>
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<td>30</td>
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<td>15</td>
<td>71%</td>
<td>31</td>
<td>97%</td>
<td></td>
</tr>
</tbody>
</table>

Notes. CSPM=Correct Sounds Per Minute; %=the percent correct of total responses made during the 1-minute timing; the blank cells are due to assessments not being conducted.

¹ Data represent average performance for each condition.
lessons 33 and 36 were stopped due to a school activity and lesson 35 was stopped due to Zora falling asleep and not making adequate progress through the lesson. These lessons were completed during the proceeding session.

*Headsprout stories.* Zora read the *Headsprout readers* 1, 2, 3, 4, and 5 with 85%, 77%, 90%, 83%, and 91% accuracy, respectively. Zora did not read the last book, as she did not complete lesson 40.

*Headsprout probes.* Zora’s results are shown in Figure 3. The data for baseline, intervention, and maintenance conditions are shown.

*Baseline.* During baseline in Tier 1, a decreasing trend was demonstrated. The mean percentage of accurate responding was 4%, with a range of 3% to 7%. Tier 2 baseline data remained low and stable at 3% accuracy on all probes. Tier 3 was low and stable with a mean percentage of 3% and a range of 0% to 6%.

*Intervention.* In general for Tier 1, an increasing trend was demonstrated; however, an increase in accuracy over baseline measures did not occur until the fourth probe (after the completion of lesson 7). The mean percentage of accurate responding was 18% with a range of 0% to 38%. A percentage of non-overlapping data points (PND) of only 57% was demonstrated and consisted of the last four data points for this condition. During the intervention phase in Tier 2, an immediate and steady increase in accuracy was demonstrated with a drop in accuracy on the last probe. The mean percentage during this condition was 31% with a range of 7% to 59%. Overall, an increasing trend was demonstrated with a PND of 100%. During the intervention phase in Tier 3, the first three probes were flat lined followed by an increasing trend for the remainder of this condition. The mean percentage was 42% with a range of 15% to 85%.
Additionally, a PND of 100% was demonstrated. Generally, an increase in performance was seen when, and only when, the intervention was applied to each Tier while the other tiers in baseline remained low and stable; therefore, experimental control was demonstrated.

*Maintenance.* During Tier 1, the maintenance probes occurred immediately following intervention, and 5 and 9.5 weeks following the end of intervention. For Tier 2, the maintenance probe was conducted 4.5 weeks following the end of intervention. Maintenance data were not collected for Tier 3 due to the school year ending. In all cases, maintenance data were higher than those obtained during the intervention phase. Specifically, Zora’s maintenance scores were 79%, 76%, and 97% for Tier 1 and 79% for Tier 2.

*Sprout cards.* Zora’s results on Sprout Card probes are also shown in Figure 3. Supplemental instruction using Sprout Cards was necessary following lessons 5, 11, 18, 23, and 30. Sprout Card set 6 was not utilized since Zora did not complete lesson 40. Zora received instruction on Sprout Card set 1 three times, in which she responded to 3 of the 10 targets correctly (30%), 4 of the 10 targets correctly (40%), and 8 of the 10 targets correctly (80%). Instruction was provided three times for set 2 as well, in which she responded to 8 of the 19 targets correctly (42%), 13 of the 19 targets correctly (68%), and 18 of the 19 targets correctly (95%). Instruction was provided twice for set 3, in which Zora correctly responded to 15 (75%) and 20 (100%) of the 20 targets on the first and second probe, respectively. Instruction was provided only once for sets 4 and 5, in which she correctly responded to 9 of 9 (100%), and 15 of 17 (88%) targets for each probe, respectively.
Figure 3. Zora’s Headsprout Probe Results.
**Progress monitoring.** AIMSWeb Progress Monitoring assessments LSF and NWF Progress monitoring assessments were conducted during baseline and after lessons 11, 23, and 36. Results for each LSF and NWF progress monitoring probes are shown in Table 6 and Table 7, respectively.

During baseline, Zora completed five LSF and four NWF progress monitoring assessments. On the LSF assessment, Zora demonstrated a mean of 6 correct responses and 10 incorrect responses. Her correct responses ranged from 2 to 12 responses per minute and her incorrect responses ranged from 8 to 12 responses per minute. On the NWF assessment, Zora demonstrated a mean of 9 correct sounds per minute and 12 incorrect sounds per minute. Her correct responses ranged from 5 to 11 sounds per minute and her incorrect responses ranged from 7 to 16 sounds per minute. During intervention, Zora’s mean performance on LSF improved to 13 correct and 10 incorrect responses, with a range of 12 to 13 correct responses and 9 to 11 incorrect responses. Her mean correct performance on NWF remained equal to her baseline means at 9 correct sounds and her mean incorrect sounds decreased to 6 incorrect sounds. A range of 6 to 15 correct sounds and 6 to 10 incorrect sounds per minute was demonstrated.

**Corwin.** Corwin completed 23 lessons. The duration of his lessons ranged from 9 minutes (lesson 1) to 49 minutes (lesson 14), with an average of 28 minutes, and a median of 25 minutes. Overall, he spent 12 hours and 25 minutes engaged with the program, making a total of 5,456 responses. He demonstrated an overall accuracy of 88.07%, with a low of 68.13% (lesson 14) and a high of 99.5% (lessons 18). Due to a high error rate on the first attempt, Corwin repeated lesson 11 a second time. Additionally, lessons 9 and 23 were stopped due to a school activity and lesson 10 was
stopped because Corwin had not made adequate progress through the lesson after 30 minutes. These lessons were completed during the proceeding session.

**Headsprout stories.** Corwin read the Headsprout readers 1, 2, 3, and 4, with 71%, 77%, 100%, and 100% accuracy, respectively. He did not read books 5 and 6, as he did not complete lesson 30 or 40.

**Headsprout probes.** Corwin’s results are shown in Figure 4. The data for baseline, intervention, and maintenance conditions are shown.

**Baseline.** During baseline, data were low and stable in Tier 1, with a mean percentage of accurate responding of 2% with a range of 0% to 3%. Tier 2 baseline data remained low and stable with a mean percentage of 2% and a range of 0% to 3%. Tier 3 baseline data showed slightly more variation compared to the first two tiers with accuracy increasing to 9% at the end of Tier 1 and back down to 6% for the last two probes. The mean accuracy percentage was 3% with a range of 0% to 9%.

**Intervention.** During Tier 1, a steadily increasing trend was demonstrated. The mean percentage of accurate responding was 29% with a range of 7% to 59%. A percentage of non-overlapping data points (PND) of 100% was demonstrated. During the intervention phase in Tier 2, the first three probes remained equal to baseline measures with an increasing trend demonstrated for the last four probes. The largest gain occurred between the fourth probe (7%) and the fifth probe (38%). The mean percentage during this condition was 17% with a range of 3% to 38%. Overall, an increasing trend was demonstrated with a PND of 57%. Due to time constraints, Corwin did not receive instruction on Tier 3 targets. Generally, an increase in performance was seen when, and
only when, the intervention was applied to each Tier while the tiers in baseline remained low and stable; therefore, experimental control was demonstrated.

**Maintenance.** During Tier 1, the maintenance probes occurred immediately and 7.5 weeks following the end of intervention. Maintenance data were not collected for Tier 2 due to the school year ending. Maintenance data remained fairly close to those obtained during the intervention phase. Specifically, Corwin’s maintenance scores were 62% and 55%.

**Sprout cards.** Corwin’s results on Sprout Card probes are also shown in Figure 4. Supplemental instruction using Sprout Cards was necessary following lessons 5, 11, 18, and 23. Sprout Card sets 5 and 6 were not utilized as Corwin did not complete lessons 30 and 40. Corwin received instruction on Sprout Card set 1 four times in which he responded to 4 of the 10 (40%), 7 of the 10 (70%), 7 of the 10 (70%) and 8 of the 10 (80%) targets correctly on the first, second, third, and fourth probes, respectively. Instruction was provided three times for set 2, in which he responded to 11 of the 19 targets correctly (58%), 15 of the 19 targets correctly (79%), and 18 of the 19 targets correctly (95%). Instruction was provided twice for set 3, in which Corwin correctly responded to 15 (75%) and 16 (80%) of the 20 targets on the first and second probes, respectively. Instruction was provided only once for set 4, in which he correctly responded to 8 of the 9 targets (89%).

**Progress monitoring.** AIMSWeb Progress Monitoring assessments LSF and NWF Progress monitoring assessments were conducted during baseline and after lessons 11 and 23. Results for each LSF and NWF probe are shown in Table 6 and Table 7, respectively.
Figure 4. Corwin’s Headsprout Probe Results.
During baseline, Corwin completed five LSF and four NWF progress monitoring assessments. On the LSF assessment, Corwin demonstrated a mean of 10 correct responses and 9 incorrect responses. His correct responses ranged from 6 to 14 responses per minute and his incorrect responses ranged from 7 to 13 responses per minute. On the NWF assessment, Corwin demonstrated a mean of 9 correct sounds per minute and 13 incorrect sounds per minute. His correct responses ranged from 0 to 19 sounds per minute and his incorrect responses ranged from 10 to 23 sounds per minute. During intervention, Corwin’s mean performance on LSF improved to 11 correct and 6 incorrect responses, with a range of 8 to 13 correct responses and 4 to 8 incorrect responses. His mean performance on NWF improved to 13 correct sounds and 7 incorrect sounds, with a range of 11 to 14 correct sounds and 6 to 8 incorrect sounds per minute.

**Jimmy.** Jimmy completed 38 lessons. The duration of his lessons ranged from 9 minutes (lesson 1) to 39 minutes (lesson 12), with an average of 19 minutes, and a median of 17 minutes. Overall, he spent 12 hours and 19 minutes engaged with the program, making a total of 7,171 responses. He demonstrated an overall accuracy of 94.09%, with a low of 84.83% (lesson 2) and a high of 99.44% (lessons 18). On two occasions, lessons 8 and 15, sessions were stopped as a result of Jimmy’s behavior (e.g., slamming the mouse, yelling, and failing to make adequate progress on activities). On both occasions, he had completed a prior lesson; therefore, he did not become disruptive until the second lesson of the session.

**Headsprout stories.** Jimmy read the *Headsprout readers* 1, 3, 4, and 5 with 100% accuracy and *Headsprout reader* 2, with 92% accuracy (i.e., one error was made). Jimmy did not read the last book, as he did not complete lesson 40.
Headsprout probes. Jimmy’s results are shown in Figure 5. The data for baseline, intervention, and maintenance conditions are shown.

Baseline. During baseline in Tier 1, data were variable but stable overall. The mean percentage of accurate responding was 22% with a range of 14% to 28%. Tier 2 baseline data remained low and stable with a mean accuracy percentage of 8% and a range of 3% to 14%. Tier 3 showed some variability but overall stability was demonstrated with a mean percentage of 6% and a range of 3% to 12%.

Intervention. Following intervention for Tier 1, there was a steady increase in accurate responding throughout the tier. The mean percentage of accurate responding was 35% with a range of 21% to 48%. A percentage of non-overlapping data points (PND) of only 50% was demonstrated and consisted of the last three data points for this condition. During the intervention phase in Tier 2, an immediate and steady increase in accuracy was demonstrated. The mean percentage during this condition was 43% with a range of 17% to 69%. Overall, an increasing trend was demonstrated with a PND of 100%. During the intervention phase in Tier 3, an increasing trend was demonstrated with a big jump between the third (39%) and fourth probe (73%) of this condition. The mean percentage was 59% with a range of 33% to 79%. Additionally, a PND of 100% was demonstrated. Overall, an increase in performance was seen when, and only when, the intervention was applied to each tier while the other tiers in baseline remained low and stable; therefore, experimental control was demonstrated.

Maintenance. During Tier 1, the maintenance probes occurred immediately, approximately 3 weeks, and 6 weeks following the end of intervention. For Tier 2, the maintenance probe was conducted 3 weeks following the end of intervention.
Maintenance data were not collected for Tier 3 due to the school year ending. In all cases, maintenance data were higher than those obtained during the intervention phase and an increasing trend was demonstrated for Tier 1. Specifically, Jimmy’s maintenance scores were 72%, 83%, and 97% for Tier 1 and 76% for Tier 2.

_Sprout cards._ Jimmy’s results on Sprout Card probes are also shown in Figure 5. Supplemental instruction using Sprout Cards was necessary following lessons 5, 11, 18, 23, and 30. Sprout Card set 6 was not utilized since Jimmy did not complete lesson 40. After Jimmy received instruction on set 1, he responded to 9 of the 10 targets correctly, performing with 90% accuracy on the probe. Instruction for set 2 was provided twice, in which Jimmy responded to 13 of the 19 targets correctly (68%) and 18 of the 19 targets correctly (95%) on the Sprout Card probes. Instruction was provided only once for sets 3, 4, and 5 in which he correctly responded to 18 of 20 (90%), 8 of 9 (89%), and 16 of 17 (94%) targets for each probe, respectively.

_Progress monitoring._ AIMSWeb Progress Monitoring assessments LSF and NWF Progress monitoring assessments were conducted during baseline and after lessons 11, 23, and 38. Results for each LSF and NWF probe are shown in Table 6 and Table 7, respectively. During baseline, Jimmy completed six LSF and five NWF progress monitoring assessments. On the LSF assessment, Jimmy demonstrated a mean of 27 correct responses and 4 incorrect responses. His correct responses ranged from 15 to 45
Figure 5. Jimmy’s Headsprout Probe Results.
responses per minute and his incorrect responses ranged from 2 to 7 responses per minute. On the NWF assessment, Jimmy demonstrated a mean of 9 correct sounds per minute and 7 incorrect sounds per minute. His correct responses ranged from 0 to 14 sounds per minute and his incorrect responses ranged from 6 to 10 sounds per minute. During intervention, Jimmy’s mean performance on LSF improved to 39 correct and 3 incorrect responses, with a range of 33 to 46 correct responses and 2 to 5 incorrect responses. His mean performance on NWF improved to 23 correct sounds and 1 incorrect sound, with a range of 8 to 31 correct sounds and 0 to 1 incorrect sounds per minute.

**Hannah.** Hannah completed 18 lessons. The duration of her lessons ranged from 11 minutes (lesson 1) to 36 minutes (lesson 12), with an average of 23 minutes, and a median of 21 minutes. Overall, she spent 7 hours and 8 minutes engaged with the program, making a total of 3,464 responses. She demonstrated an overall accuracy of 92.39%, with a low of 78.62% (lesson 14) and a high of 98.88% (lessons 18).

**Headsprout stories.** Hannah read the Headsprout readers 1, 2, and 3 with 86%, 85%, and 80% accuracy, respectively. She did not read books 4, 5 and 6, as she did not complete lessons 23, 30, or 40.

**Headsprout probes.** Hannah’s results are shown in Figure 6. The data for baseline, intervention, and maintenance conditions are shown.

**Baseline.** During baseline, data were slightly variable but overall stable in Tier 1, with a mean percentage of accurate responding of 24% with a range of 21% to 28%. Tier 2 baseline data remained stable at 3% accuracy for the entire duration of baseline. Tier 3 baseline data showed slight variability with a mean percentage of 14% and a range of 12% to 18%.
**Intervention.** During Tier 1, a steadily increasing trend was demonstrated. The mean percentage of accurate responding was 42% with a range of 28% to 62%. A percentage of non-overlapping data points (PND) of 86% was demonstrated. During the intervention phase in Tier 2, an increase in accuracy was demonstrated for the first probe, a decrease back to baseline levels for the second probe, and then a steady increase the last two probes. The mean percentage during this condition was 8% with a range of 3% to 14%. Overall, an increasing trend was demonstrated with a PND of 75%. Due to a sudden relocation, Hannah did not complete Tier 2 or receive instruction on Tier 3 targets.

**Maintenance.** During Tier 1, the maintenance probe occurred immediately following intervention and was 62%. Maintenance data were not collected for Tier 2 or Tier 3.

**Sprout cards.** Hannah’s results on Sprout Card probes are also shown in Figure 6. Supplemental instruction using Sprout Cards was necessary following lessons 5, 11, and 18. Sprout Card sets 4, 5 and 6 were not utilized, as Hannah did not complete lessons 23, 30 and 40. Instruction was provided only once for each Sprout Card set, in which Hannah correctly responded to 9 of 10 (90%), 16 of 19 (84%), and 16 of 20 (80%) targets on Sprout Card probes 1, 2, and 3, respectively.

**Progress monitoring.** AIMSWeb Progress Monitoring assessments LSF and NWF Progress monitoring assessments were conducted during baseline and after lesson 11. Results for each LSF and NWF probe are shown in Table 6 and Table 7, respectively.
Figure 6. Hannah’s Headsprout Probe Results.
During baseline, Hannah completed seven LSF and six NWF progress monitoring assessments. On the LSF assessment, Hannah demonstrated a mean of 23 correct responses and 10 incorrect responses. Her correct responses ranged from 15 to 33 responses per minute and her incorrect responses ranged from 2 to 18 responses per minute. On the NWF assessment, Hannah demonstrated a mean of 21 correct sounds per minute and 13 incorrect sounds per minute. Her correct responses ranged from 14 to 25 sounds per minute and her incorrect responses ranged from 8 to 18 sounds per minute. At the end of Tier 1, Hannah made 23 correct and 8 incorrect responses and 19 correct and 6 incorrect responses per minute on the LSF and NWF assessments, respectively.

**Evelyn.** Evelyn completed 8 lessons. The duration of her lessons ranged from 12 minutes (lesson 1) to 46 minutes (lesson 5), with an average of 29 minutes, and a median of 30 minutes. Overall, she spent 3 hours and 53 minutes engaged with the program, making a total of 1,451 responses. She demonstrated an overall accuracy of 83.84%, with a low of 72.63% (lesson 5) and a high of 94.14% (lessons 6). Lesson 9 was started on five separate occasions; however, Evelyn engaged in high rates of work refusal and never completed the lesson. Time spent on these attempts ranged from 7 minutes to 22 minutes.

**Headsprout stories.** Evelyn read the first Headsprout reader with 71% accuracy. She did not read books 2, 3, 4, 5 and 6, as she did not complete lessons 11, 18, 23, 30, or 40.

**Headsprout probes.** Evelyn’s results are only shown in Figure 1, as she did not complete a single tier.

**Baseline.** During Tier 1 baseline, a localized decreasing trend for the first three probes was demonstrated that flattens out prior to intervention. A mean percentage of
accurate responding of 6% with a range of 3% to 14% was demonstrated. Tier 2 baseline data started at 7% accuracy and then remained stable at 3% accuracy for the entire duration of baseline. Tier 3 baseline data showed slight variability with a mean percentage of 7% and a range of 3% to 9%.

**Intervention.** During Tier 1, a steadily increasing trend was demonstrated; however, a percentage of non-overlapping data points (PND) of only 25% was demonstrated. The mean percentage of accurate responding was 10% with a range of 7% to 17%. Evelyn did not complete Tier 1 or receive instruction on Tier 2 and Tier 3 targets.

**Maintenance.** Maintenance data were not collected.

**Sprout cards.** Supplemental instruction using Sprout Cards was necessary following lesson 5. Sprout Card sets 2, 3, 4, 5 and 6 were not utilized as Evelyn did not complete lessons 11, 18, 23, 30 and 40. Instruction was provided only once on Sprout Card set 1, in which Evelyn responded to 8 of the 10 targets (80%) correctly.

**Progress monitoring.** AIMSWeb Progress Monitoring assessments LSF and NWF were conducted during baseline only. Results for each LSF and NWF probe are shown in Table 6 and Table 7, respectively.

During baseline, Evelyn completed four LSF and four NWF progress monitoring assessments. One additional LSF and NWF assessment was attempted; however, Evelyn engaged in noncompliant behavior and did not make any appropriate responses during the allotted time (i.e., one minute). On the LSF assessment, Evelyn demonstrated a mean of 4 correct responses and 6 incorrect responses. Her correct responses ranged from 0 to 9 responses per minute and her incorrect responses ranged from 2 to 7 responses per
minute. On the NWF assessment, Evelyn demonstrated a mean of 3 correct sounds per minute and 5 incorrect sounds per minute. Her correct responses ranged from 1 to 5 sounds per minute and her incorrect responses ranged from 2 to 6 sounds per minute. No progress monitoring assessments were conducted during the intervention phase.

The Effects of the Headsprout Early Reading program on On-task Behavior

The mean percentage of on-task intervals, as well as the range of time spent on task, during general education reading instruction for all participants can be found in Table 8.

Table 8. Levels of On-task Behavior for all Participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Baseline</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
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<td></td>
<td>Mean</td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Cher</td>
<td>19%</td>
<td>15-25%</td>
<td>44%</td>
<td>15-78%</td>
</tr>
<tr>
<td>Corwin</td>
<td>37%</td>
<td>14-68%</td>
<td>16%</td>
<td>0-30%</td>
</tr>
<tr>
<td>Evelyn</td>
<td>41%</td>
<td>5-72%</td>
<td>36%</td>
<td>10-63%</td>
</tr>
<tr>
<td>Hannah</td>
<td>29%</td>
<td>12-60%</td>
<td>57%</td>
<td>38-75%</td>
</tr>
<tr>
<td>Jacelyn*</td>
<td>89%</td>
<td>77-97%</td>
<td>98%</td>
<td></td>
</tr>
<tr>
<td>Jimmy</td>
<td>34%</td>
<td>8-65%</td>
<td>47%</td>
<td>8-85%</td>
</tr>
<tr>
<td>Zora</td>
<td>27%</td>
<td>12-45%</td>
<td>27%</td>
<td>15-38%</td>
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<tr>
<td>Group¹</td>
<td>31%</td>
<td>5-68%</td>
<td>38%</td>
<td>0-85%</td>
</tr>
</tbody>
</table>

Note. Blank cells are a result of observations not being conducted.
* Comparison peer.
¹ Data represent mean levels of on-task behavior for all target participants.
Cher. Compared to baseline measures, an increase in mean percentage of on-task intervals was demonstrated during Tiers 1, 2, and 3, with Tier 2 showing the highest mean percentage of 77%. A steady increase in the median percentage of intervals on task was also demonstrated. The median percentage of intervals on task during baseline, Tier 1, Tier 2, and Tier 3 was 18%, 40%, 67%, and 75%, respectively. Her highest level of on-task behavior occurred at the end of Tier 2, when she was on task for 98% of the intervals, and her lowest occurred during the second baseline observation and the first Tier 1 observation, when she was on task for 15% of the intervals on both occasions.

Zora. Compared to baseline measures, an increase in mean percentage of on-task intervals was demonstrated during Tiers 2 and 3, with Tier 2 showing the highest mean percentage at 58%. An increase in the median percentage of intervals on task over the baseline condition was also demonstrated. The median percentage of intervals on task during baseline, Tier 1, Tier 2, and Tier 3 was 25%, 27%, 60%, and 33%, respectively. The highest level of on-task behavior occurred during the final observation, when Zora was on task for 88% of the intervals, and the lowest occurred during the last baseline observation when she was on task for 12% of the intervals.

Corwin. Compared to baseline measures, a decrease in mean percentage of intervals on task was demonstrated during Tier 1 and an increase in mean percentage of intervals on task was demonstrated during Tier 2, with a mean percentage at 49%. An increase in the median percentage of on-task intervals over the baseline condition was demonstrated for Tier 2 only. The median percentage of intervals on task during baseline, Tier 1, and Tier 2 was 28%, 18%, and 42%, respectively. The highest level of on-task behavior occurred during the first probe of Tier 2, when Corwin was on task for 77% of
the intervals, and the lowest occurred during the last Tier 1 observation when he was on task 0% of the intervals.

**Jimmy.** Compared to baseline measures, an increase in mean percentage of on-task intervals was demonstrated during Tiers 1, 2, and 3, with Tier 2 showing the highest mean percentage of 51%. An increase in the median percentage of intervals on task was also demonstrated. The median percentage of on-task intervals during baseline, Tier 1, Tier 2, and Tier 3 was 27%, 48%, 38%, and 48%, respectively. The highest level of on-task behavior occurred at the end of Tier 2, when Jimmy was on task for 97% of the intervals, and the lowest occurred during the fifth baseline observation and the second Tier 1 observation, when he was on task for 8% of the intervals on both occasions.

**Hannah.** The mean percentage of on-task intervals increased from 29% during baseline to 57% during Tier 1. During the only observation that was conducted during Tier 2, Hannah was on task for 87% of the intervals. An increase in the median percentage of intervals on task over the baseline condition was also demonstrated. The median percentage of on-task intervals during baseline and Tier 1 was 43% and 57%, respectively. The highest level of on-task behavior occurred during the final observation (after lesson 15), when Hannah was on task for 87% of the intervals, and the lowest occurred during the fourth baseline observation when she was on task for 12% of the intervals.

**Evelyn.** The mean percentage of on-task intervals during baseline and Tier 1 was 41% and 36%, respectively. The median percentage of on-task intervals was 33% during baseline and 35% during Tier 1. The highest percentage of intervals on task occurred during the last baseline observation, in which Evelyn was on task for 72% of the intervals.
intervals. The lowest percentage of intervals on task occurred during the first baseline observation, in which she was on task for 5% of the intervals.

**Jacelyn.** Five on-task observations were conducted with the comparison peer. Her percentage of intervals on task ranged from 77% to 98%, with an overall mean percentage of 89% and a median of 92%.

**Group.** The overall mean levels of on-task behavior across target participants increased following the introduction of the intervention compared to baseline measures (see Table 8). More specifically, Cher and Jimmy’s on-task behavior increased in Tiers 1, 2, and 3 compared to the baseline condition. Hannah demonstrated increased on-task behavior in Tiers 1 and 2 (she did not complete Tier 2 or any lessons in Tier 3). Zora and Corwin showed no change and a decrease in on-task behavior during Tier 1, respectively and both demonstrated increased on-task behavior during Tier 2. Evelyn’s on-task behavior decreased in Tier 1 (she did not complete Tier 1 or any lessons in Tiers 2 and 3 and was dismissed from the study due to noncompliant behavior).

**The Effects of the Headsprout Reading Program on Post-Test Measures Compared to Pre-Test Scores**

**Headsprout assessments.** All target participants showed increases on both the sound and word assessments. Figure 7 and 8 show the target participants’ pre-and post-test scores, compared to the comparison peer’s scores, for the sound and word assessments, respectively.
Figure 7. Participant Scores on the Pre-and Post-Test Headsprout Sound Assessment.

*Note.* The dotted horizontal line represents the highest accuracy level on the sound assessment prior to intervention (i.e., the performance of the comparison peer, Jacelyn).
Figure 8. Participant Scores on the Pre-and Post-Test Headsprout Word Assessment.

Note. The dotted horizontal line represents the highest accuracy level on the word assessment prior to intervention (i.e., the performance of the comparison peer, Jacelyn).

Cher. Cher correctly responded to 24% and 97% of the sounds and 5% and 94% of the words on the pre-and post-test, respectively. Cher completed all 40 lessons and received instruction on all targets; therefore, her performance on the instructed-targets-
only was equivalent to her performance on all targets (see Figure 9). Overall, Cher learned 25 new sounds and 64 new words.

Figure 9. *Cher’s Pre-and Post-Headsprout Assessment Scores.*

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**Jimmy.** Jimmy correctly responded to 26% and 97% of the sounds and 7% and 81% of the words on the pre- and post-test, respectively. Jimmy completed 38 lessons and received instruction on all sounds and 70 of the 72 words. Therefore, his performance on
the instructed-sounds-only was equivalent to his total sounds pre- and post-tests, and he correctly responded to 7% and 80% on the instructed-word-only pre- and post-tests (see Figure 10). Overall, Jimmy learned 24 sounds and 52 words.

Figure 10. Jimmy’s Pre-and Post-Headsprout Assessment Scores.
Zora. Zora correctly responded to 24% and 85% of the sounds and 6% and 75% of the words on the pre-and post-test, respectively. Zora completed 36 lessons and received instruction on all sounds and 70 of the 72 words. Therefore, her performance on the instructed-sounds-only was equivalent to her total-sounds pre- and post-tests. She correctly responded to 43% and 74% on the instructed-words-only pre- and post-tests, respectively (see Figure 11). Overall, Zora learned 21 sounds and 50 words.

Figure 11. Zora’s Pre-and Post-Headsprout Assessment Scores.
**Corwin.** Corwin correctly responded to 9% and 47% of the sounds and 5% and 32% of the words on the pre-and post-test, respectively. He completed 23 lessons and received instruction on 24 of the sounds and 43 of the words. Based on only those targets instructed, he correctly responded to 8% and 58% of the sounds and 7% and 49% of the words on the pre-and post-test, respectively (see Figure 12). Overall, Corwin learned 12 sounds and 18 words.

Figure 12. *Corwin’s Pre-and Post-Headsprout Assessment Scores.*
**Hannah.** Hannah correctly responded to 30% and 76% of the sounds and 1% and 30% of the words on the pre-and post-test, respectively. She completed 18 lessons and received instruction on 22 of the 34 target sounds and 30 of the 72 target words. Based on only those targets instructed, she correctly responded to 32% and 86% of the sounds and 0% and 60% of the words on the pre-and post-test, respectively (see Figure 13). Overall, Hannah learned 12 sounds and 19 words.

Figure 13. *Hannah’s Pre-and Post-Headsprout Assessment Scores.*
**Evelyn.** Evelyn correctly responded to 21% and 41% of the sounds and 4% and 8% of the words on the pre-and post-test, respectively. She completed 8 lessons and received instruction on 15 of the sounds and 12 of the words. Based on only those targets instructed, she correctly responded to 50% and 78% of the sounds and 13% and 38% of the words on the pre-and post-test, respectively (see Figure 14). Overall, Evelyn learned 3 sounds and 2 words.

Figure 14. *Evelyn’s Pre-and Post-Headsprout Assessment Scores.*
Jacelyn. Jacelyn correctly responded to 68% and 62% of the sounds (see Figure 7) and 40% and 36% of the words (see Figure 8) on the pre-and post-test, respectively. On the sound post-test, compared to the pre-test, she correctly responded to 5 new sounds; however, she missed 7 sounds that she had responded to correctly on the pre-test. Similarly, on the word post-test, she correctly responded to 4 new words but missed 7 words that she had correctly read on the pre-test.

Group. Prior to intervention, the target participants, as a whole, knew 11 sounds and 7 words. Following intervention, they had learned all 34 sounds and 70 of the 72 words. The only words that none of the target participants responded to correctly on the post-test were should and standing. This results in an average of 16 sounds (range of 3 to 25) and 34 words (range of 2 to 64) learned per target participant.

Benchmark assessments. All target participants showed an increase in the number of correct responses per minute on all four subtests from pre to post-tests, with the exclusion of Evelyn who only showed an increase on the LNF and the PSF subtests. Additionally, some of the target participants jumped to the next percentile ranking on some of the subtests. Specifically, on the LNF subtest, Zora moved from below the 10th percentile on the Winter Benchmark to the 10th percentile on the Spring Benchmark; Cher moved from the 25th percentile to the 50th percentile on the LSF subtest; on the PSF subtest, Corwin moved from the 10th percentile to between the 25th and 50th percentiles, Evelyn moved from below the 10th percentile to the 25th percentile, and Jimmy moved from the 25th percentile to the 75th percentile; on the NWF subtest, Hannah placed between the 25th and 50th percentiles initially and moved to the 50th percentile and Jimmy moved from the 25th percentile to between the 25th and 50th percentiles.
Despite the target participants demonstrating improved frequencies, a decrease in percentile ranking occurred for some target participants on some subtests. For example, on the LNF subtest Corwin moved from the 25th to the 10th percentile and Jimmy moved from the 75th to the 50th percentile; on the LSF subtest Evelyn moved from the 10th percentile to below the 10th percentile and Hannah moved from the 50th to the 25th percentile; and on the PSF subtest Hannah moved from the 25th to the 10th percentile.

Jacelyn, the comparison peer, demonstrated an increased frequency on the PSF subtest, a decreased frequency on the LNF and NWF subtests, and remained stable on the LSF subtest. Her responses per minute resulted in a decrease from the 75th to the 25th percentile on the LNF subtest, the 75th to the 50th percentile on the LSF subtest, and the 90th to the 50th percentile on the NWF subtest.

**Woodcock Reading Mastery Test-Norm Updated (WRMT-NU).** The Word Identification and Word Attack subtests were conducted and each participant’s scores can be found in Table 9. Due to early termination of the study for Hannah (relocation) and an out-of-school suspension for Evelyn, this assessment was not conducted with these two target participants. All participants scored above grade level on both subtests, with the exception of Corwin who scored on grade level on the Word Identification subtest and below grade level on the Word Attack subtest. Cher scored above Jacelyn, the comparison peer, on the Word Attack subtest.
Table 9. Pre-Post AIMSWeb Assessments for all Participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>LNF Frequency</th>
<th>LSF Frequency</th>
<th>PSF Frequency</th>
<th>NWF Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W</td>
<td>S</td>
<td>W</td>
<td>S</td>
</tr>
<tr>
<td>Cher</td>
<td>16</td>
<td>22</td>
<td>13</td>
<td>41*</td>
</tr>
<tr>
<td>Corwin</td>
<td>31</td>
<td>32</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Evelyn</td>
<td>19</td>
<td>23</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Hannah</td>
<td>47</td>
<td>48</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td>Jimmy</td>
<td>54</td>
<td>55</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>Zora</td>
<td>11</td>
<td>26*</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Jacelyn¹</td>
<td>58</td>
<td>45</td>
<td>42</td>
<td>42</td>
</tr>
</tbody>
</table>

*Notes: LNF=Letter Name Fluency; LSF=Letter Sound Fluency; PSF=Phoneme Segmentation Fluency; NWF=Nonsense Word Fluency; W=Winter Benchmark; S=Spring Benchmark. The data are number of ¹Comparison peer.

* Denotes that the skill increased to the next percentile.
Table 10. *WRMT-NU Results for all Participants.*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Word Identification</th>
<th></th>
<th>Word Attack</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw Score</td>
<td>Standard Score</td>
<td>Grade Equivalent</td>
<td>Percentile</td>
</tr>
<tr>
<td>Cher</td>
<td>21</td>
<td>114</td>
<td>1.6</td>
<td>82</td>
</tr>
<tr>
<td>Corwin</td>
<td>4</td>
<td>100</td>
<td>K.9</td>
<td>50</td>
</tr>
<tr>
<td>Evelyn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hannah</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jimmy</td>
<td>22</td>
<td>115</td>
<td>1.5</td>
<td>83</td>
</tr>
<tr>
<td>Zora</td>
<td>8</td>
<td>105</td>
<td>1.2</td>
<td>62</td>
</tr>
<tr>
<td>Jacelyn*</td>
<td>25</td>
<td>117</td>
<td>1.7</td>
<td>86</td>
</tr>
</tbody>
</table>

*Notes:* Blank cells indicate that those participants were not available for testing.
* Comparison peer.

**SSIS.** The classroom teacher completed the SSIS teacher’s form for each participant and the Problem Behaviors Subscales (i.e., externalizing, bullying, hyperactivity/inattention, and internalizing behaviors), Problem Behaviors Scale and Academic Competence Scale scores are presented in Table 11. All target participants scored above average in externalizing and hyperactivity/inattention behaviors on the pre-assessment. In general, all participants improved or remained stable in all four categories from pre-to post-assessments, with the exception of Evelyn’s internalizing behaviors and Corwin’s bullying behaviors. All of the participants’ Problem Behaviors Scale scores improved compared to pre-intervention, with the exception of Corwin who moved from
Table 11. *Social Skills Improvement Scales Results for all Participants.*

<table>
<thead>
<tr>
<th>Participant</th>
<th>Social Skills Scale</th>
<th>Problem Behaviors Scale</th>
<th>Academic Competence Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Externalizing</td>
<td>Bullying</td>
<td>Hyperactivity</td>
</tr>
<tr>
<td>Cher</td>
<td>A A</td>
<td>A A</td>
<td>A A</td>
</tr>
<tr>
<td>Corwin</td>
<td>AA AA</td>
<td>A AA</td>
<td>AA AA</td>
</tr>
<tr>
<td>Evelyn</td>
<td>AA AA</td>
<td>AA AA</td>
<td>AA AA</td>
</tr>
<tr>
<td>Hannah</td>
<td>AA AA</td>
<td>AA A</td>
<td>AA AA</td>
</tr>
<tr>
<td>Zora</td>
<td>AA A</td>
<td>AA A</td>
<td>AA A</td>
</tr>
<tr>
<td>Jacelyn*</td>
<td>A A</td>
<td>A A</td>
<td>A A</td>
</tr>
</tbody>
</table>

*Notes. A= Average; AA= Above Average; BA= Below Average.*

*Comparison peer.*
the 86th percentile to the 93rd percentile. Cher demonstrated the biggest improvement as she moved from the 95th percentile at pre-assessment to the 42nd percentile at post-assessment. Five of the six target participants improved on the Academic Competence Scale with Cher and Jimmy making the biggest improvements. Cher scored at the 13th percentile prior to the intervention and at the 67th percentile following the intervention, and Jimmy scored at the 20th percentile prior to the intervention and the 74th percentile following the intervention. The other target participants made substantial percentile gains with the exception of Corwin, who moved from the 20th percentile at pre-assessment to the 9th percentile following intervention. Jacelyn, the comparison peer, remained at the 96th percentile from the pre-to post-assessment.

Social Validity

Teacher. The classroom teacher filled out a questionnaire for each target participant. The number of target participants that she selected either agree, somewhat agree, somewhat disagree, or disagree for each question can be found in Table 12. Overall, the teacher demonstrated an interest in the program and satisfaction with the results; however, she stated that she would only use Headsprout under close supervision with Evelyn and Corwin. She asked several questions about the program and stated that she planned to acquire the program for her students next year.

Parent. These data are not available, as no parental social validity questionnaires were returned.

Target participants. All target participants stated that Headsprout was fun, that it helped improve their reading skills, and that they enjoyed reading. All target participants, except Corwin, also stated that Headsprout helped improve their listening skills during
classroom reading instruction. When asked about their favorite thing about Headsprout, all participants stated an example of one or more of the characters. When asked what they did not like about the program, all stated that they liked everything.

Table 12. *Teacher Social Validity Results*

<table>
<thead>
<tr>
<th>Question</th>
<th>Agree</th>
<th>Somewhat Agree</th>
<th>Somewhat Disagree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The intervention successfully increased the student's reading skills</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2. The intervention positively impacted the student's problem behavior during reading instruction</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3. The intervention positively impacted the student's behavior during activities not related to reading</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4. The intervention was appropriate to increase student reading skills</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5. The intervention was appropriate to deal with the student's problem behavior</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6. I would use this intervention to increase reading skills</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I would use this intervention to decrease problem behavior</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I believe the intervention would be easy to implement within my classroom</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 5: Discussion

The purpose of this study was to evaluate the effects of the Headsprout Early Reading Program (www.headsprout.com) on the reading skills and on-task behavior of kindergarten students with concomitant reading and social skill deficits attending an urban school. A multiple baseline design across participants, as well as across instructional targets, was utilized. Target participants were introduced to the intervention across four tiers and Headsprout instructional targets (i.e., sound elements and words) were divided into three sets (i.e., three tiers) based on the program’s lesson sequence (e.g., Set 1/ Tier 1 included lessons 1-11). Results indicate that computer-assisted instruction (CAI), provided by the Headsprout Early Reading program (www.headsprout.com), effectively improved program-specific reading skills (i.e., those sound and word targets instructed by the program); general early literacy skills, as assessed by the AIMSWeb Tests of Early Literacy (i.e., letter names and sounds, phoneme segmentation, and nonsense word decoding); and levels of on-task behavior, measured using five-second whole-interval recording procedures, during classroom reading instruction. Moreover, students maintained learned-sound elements and words with levels of accuracy that exceeded those obtained during the acquisition phase. Further, high levels of satisfaction with the intervention and the results were reported by the target participants and the classroom teacher, indicating that the Headsprout Early Reading program (www.headsprout.com) might be a socially valid intervention to
improve the reading skills and the on-task behavior of at-risk students with concomitant reading and social skill behavior deficits.

Hall and colleagues (2000) recommended that CAI research should focus on using effective teaching practices, presenting material systematically, and providing consistent correction procedures with relevant examples and additional practice. Further, maintenance and generalization of reading skills beyond the CAI application should be measured. The present study meets these recommendations and extends the literature base in other important ways.

First, this study contributes to the scarce literature base on the use of computer-based instruction for improving the reading skills of young, at-risk learners. Although previous research has demonstrated mixed results regarding the effectiveness of CAI for improving the reading skills of low-performers (e.g., Blok et al., 2002; Cassady & Smith, 2004; Macaruso & Walker, 2008), this study adds to the literature in support of the utility of CAI in general, and the Headsprout Early Reading program more specifically, in improving the reading skills of struggling readers. However, additional studies are needed before definitive statements regarding the overall effectiveness of the Headsprout program can be made.

Second, this study addresses several limitations found in previous research. For example, the fidelity of the implementation of the intervention was measured, the potential functions of off-task behavior prior to the intervention through informal observations were examined, and changes in both academic and on-task behaviors over time were assessed. Finally, it is the first study to directly measure whether students
learned the targets instructed by Headsprout and to assess the effects of CAI on levels of on-task behavior during classroom instruction.

The remainder of this chapter will focus on the effects of the Headsprout Early Reading program (www.headsprout.com) on the target participants’ reading skills and levels of on-task behavior; the social validity of the intervention; the limitations of the current study along with future research recommendations; and finally, implications for the use of CAI within urban classrooms.

**The Effects of the Headsprout Early Reading Program on Reading Achievement**

A functional relation between the Headsprout Early Reading program and increased performance on reading-related assessments was demonstrated, both across participants and instructional targets (lessons). In other words, improvements in performance were demonstrated when, and only when, the target participant was exposed to the intervention (or the instructional target was introduced). The program provided effective instruction on letter-sound relations and decoding skills, as evidenced by gains in accuracy on the Headsprout and progress monitoring probes over baseline conditions, as well as increased levels of accuracy on the post-Headsprout assessment compared to the pre-Headsprout assessment.

Cher’s and Jimmy’s WRMT-NU (Woodcock, 1998) scores approached those obtained by Jacelyn (i.e., the comparison peer) on both the Word Identification and Word Attack subtests. Further, Cher demonstrated more advanced word-attack skills than those demonstrated by Jacelyn. These findings support the efficacy of early, intensive reading instruction to remediate some reading deficits and mitigate the achievement gap between at-risk students and those students at low risk of experiencing reading failure (Parkinson
& Rowan, 2008; Yurick, Cartledge, Kourea, & Keyes, 2012). Additionally, excluding Evelyn, all target participants demonstrated increased correct responses per minute on all post-test AIMSWeb measures. Contrarily, Jacelyn only demonstrated gains on the phoneme segmentation fluency (PSF) subtest. This same pattern is seen with participants’ performance on the Headsprout pre-and post-assessments. All target participants demonstrated marked improvements on both the sound elements and words instructed during the Headsprout program, with Cher, Zora, and Jimmy surpassing Jacelyn’s initial performance on the Headsprout assessment. Moreover, Jacelyn correctly responded to fewer sound elements and words on the post-test, demonstrating a decrease in performance from the pre-to post-assessment. This finding is similar to results in previous research. Yurick and colleagues (2012) found that students, even those who do not show initial signs of reading failure risk, might be more likely to regress on reading skills if they do not receive high-quality reading instruction.

Headsprout is designed “to teach reading and decoding skills to the mid-second-grade level in 24 instructional hours” (Layng et al., 2003). As demonstrated by the target participants’ scores on the WRMT-NU (Woodcock, 1998), many of them were on track to meet this goal. After engaging with the program for only approximately 12 hours, Cher demonstrated word-attack skills equivalent to the average student in the second month of second grade. Further, Zora and Jimmy both scored in the middle to end of the first grade after spending 14 and 12 hours engaged with the program, respectively. Contrarily, Corwin also spent 12 hours engaged with the program and he demonstrated beginning Kindergarten level word-attack skills. However, Corwin demonstrated difficulty comprehending and producing age-appropriate speech and was given a speech disability
diagnosis, which may have influenced his slower progression compared to the other target participants.

Researchers have found that consistent and frequent exposure to reading instruction is necessary to achieve positive results (e.g., Hecht & Close, 2002; Stanovich 1986), which is supported by the findings of this study. In general, those target participants who completed the most lessons made the largest gains on both the standardized and program-specific assessments. However, an important distinction must be noted. It does not appear that the amount of time spent on the computer is the critical variable in bolstering reading skills. Rather, the number of lessons, and therefore the number of correct learning trials completed, seems to be more significant. To illustrate, Zora spent the greatest amount of time (i.e., 14 hours) interacting with the program, but she did not complete the greatest number of lessons or make the greatest overall gains. Moreover, Corwin spent 12 hours engaged with the program, which is equivalent to the time Cher and Jimmy spent; however, he completed 16 and 14 fewer lessons than Cher and Jimmy, respectively. Cher and Jimmy completed the highest number of lessons and also demonstrated the highest level of performance at the termination of the study. Compared to Cher and Jimmy, Zora and Corwin were more likely to engage in off-task behavior during intervention sessions and to make a higher number of incorrect responses. Therefore, although time spent engaged with the computer-based program is essential, high-quality interactions also play a vital role. In other words, students must be actively engaged and engaging in correct responses to benefit from instruction (Bost & Riccomini, 2006).
Positive gains in prereading and reading skills, as well as the quality of reading responses, resulted from exposure to the intervention. Initially, none of the target participants correctly segmented words; rather, most of them provided the corresponding letter name when instructed to read a word. At the end of the study, all target participants had demonstrated an increased ability to accurately segment (i.e., sound out) words. However, this skill did not guarantee accurate blending of the sound components of a word. On several occasions throughout the study, target participants would correctly segment a word but incorrectly blend the sounds, resulting in the response being recorded as an error. Corwin demonstrated the greatest difficulty with correctly blending sounds. This may have been due to hypothesized hearing difficulties, as indicated by his use of unclear speech and frequent requests to have directions repeated. A hearing test would need to be conducted to rule out impaired hearing as the cause of his discrimination difficulties (Musti-Rao & Cartledge, 2007). Further, a relationship between language delay and reading ability has been posited (Roth, Speece, & Cooper, 2002); therefore, Corwin’s speech delay diagnosis may have contributed to his difficulties in learning to accurately decode words.

Zora also demonstrated greater difficulty accurately decoding words than the other target participants. For example, she required additional assistance from the researcher to correctly segment and blend word components during the Headsprout lessons, especially during the Headsprout stories presented at the end of the computer lesson. Based on her responses throughout the study, it appears that she is a “whole-word” reader; therefore, it is possible that she may require additional explicit instruction
beyond that provided by the Headsprout program to sufficiently learn the phoneme-grapheme relation and to apply this knowledge to decode words.

Generally speaking, an essential goal of teaching phonics and decoding skills is to enable students to accurately read words in novel contexts. Both generalization and maintenance of reading skills are necessary to be a successful reader and are each discussed below, as they pertain to this particular study.

**Generalization.** Generalization refers to the occurrence of a response under conditions that differ from those present during training (Cooper et al., 2007). Two types of generalization were required in this study: (a) learning to read words on the computer screen and then transferring this skill to read words in print form on paper (i.e., probes, assessments, and Headsprout stories), and (b) learning a sound element under one set of conditions and then applying that knowledge when reading words containing the learned sound element under a different set of conditions (e.g., learning /an/ and reading the words *van, San, ran, and fan*). All target participants demonstrated difficulty with generalizing word-reading skills learned on the computer to the printed materials, particularly in the beginning of the study. Participants responded correctly during the Headsprout lessons but made errors on those same targets during probes (e.g., said the letter names or incorrect letter sound).

Generalization of skills rarely occurs naturally and therefore must be directly targeted (Stokes & Baer, 1977). The use of Sprout Cards allowed for direct generalization training from the computer to paper materials. By providing additional, explicit instruction using the Sprout Cards, the equivalent relation between the printed word on the computer and the printed word on the paper was directly targeted. Additionally,
explicit instruction on segmenting and blending the Sprout Card words provided additional assistance with identifying sound elements within words and applying the phoneme-grapheme relations instructed during the Headsprout lesson.

Alternatively, the errors made on the probes directly following accurate responding during the computer lessons may not have been solely a result of a lack of generalization. Rather, the flashcards used for all Headsprout probes may have come to control guessing or incorrect responses, possibly influenced by the lack of verbal feedback from the researcher regarding the correctness of a response. A participant’s response (correct or incorrect) resulted in the removal of the presented flashcard and the presentation of the next flashcard, which may have reinforced incorrect responses. To illustrate, immediately after correctly decoding instructional targets during the Headsprout lesson and Sprout Card instruction, a target participant often responded by saying, “I don’t know” or making an incorrect response to those same instructional targets during the Headsprout probes. There are three plausible explanations for such patterns of responding: (a) the Headsprout probe flashcards served as a stimulus that evoked a guessing or incorrect response; (b) the response effort of correctly responding to the instructional targets was too great; or (c) the correct reading response was under the control of both the textual stimulus (i.e., grapheme) and a verbal prompt (e.g., “sound it out”) as opposed to the textual stimulus alone. The latter of these is highly probable given that the target participants were less likely to sound a word out in the absence of a verbal prompt (e.g., during a Headsprout probe or assessment) compared to in the presence of the verbal prompt (e.g., Headsprout lesson and Sprout Card instruction).
During the course of this study, most target participants demonstrated an improved ability to generalize skills. Therefore, it is possible that a series of instructional opportunities is required to assist in the establishment of a prior knowledge that might make future skill generalization easier. Effective instruction that systematically builds on previous lessons can increase learners’ abilities to focus on the salient characteristics of instructional stimuli. In turn, this ability can promote the generalization of skills.

**Maintenance.** Maintenance refers to the presence of a skill after the termination of all or part of the intervention (Cooper et al., 2007). Maintenance data were collected following Tier 1 and Tier 2. Generally speaking, increased performances during these probes were demonstrated over those obtained during the acquisition phase for the target participants. Further, the highest rates of accuracy occurred during the last maintenance probes for Tier 1. This means that target participants performed better after a longer period of time had passed since the completion of the last lesson (i.e., lesson 11). This demonstrates that proficient reading skills build on a foundation and require extensive practice before reaching optimal levels of performance. This finding is aligned with the *Matthew effect* (Stanovich, 1986), which states that those students with the strongest skills are most likely to demonstrate improvements whereas those with more limited skills are the least likely to demonstrate improvements. Additionally, it is also possible that as the target participants developed better reading skills, they read more in various environments, therefore, further improving their reading skills. Conversely, if an effective instructional intervention does not occur for children at risk of experiencing reading failure, they are likely to fall further behind their more skilled peers.
The Effects of the Headsprout Early Reading program on On-task Behavior

First, it must be stated that given the methods utilized in this study, a functional relation between reading achievement and on-task behavior cannot be determined. Nonetheless, these data do shed light on the relationship between reading skills and on-task behavior during classroom activities. Overall, increases in on-task behavior were correlated with exposure to the intervention. That is, the longer the target participant participated in the study, and the better his or her reading skills became, the more time he or she spent on task during the general education classroom reading instruction. For example, all target participants who made it to Tier 2 demonstrated improved levels of on-task behavior. Zora’s on-task behavior showed no change until she entered Tier 2 and Corwin’s on-task behavior decreased in Tier 1 but increased in Tier 2. Based on these findings, it appears that higher reading abilities and higher rates of on-task behavior are positively correlated. This is consistent with previous studies that examined the relationship between reading and social skills (e.g., Beck et al., 2009; Lane et al., 2001; Lingo et al., 2006; Wanzek et al., 2006; Wheby et al., 2003). However, there may be a lag between improved reading skills and improved on-task behavior for some students.

Evelyn completed eight Headsprout lessons and demonstrated some gains on reading skills; however, her on-task behavior during classroom reading instruction dropped below those levels obtained during the baseline condition. The classroom teacher also reported an overall increase in the occurrence and severity of aberrant behavior (e.g., biting and pinching peers, screaming and throwing tantrums, eloping from the classroom) during classroom instruction. Although this behavior could not be adequately addressed within the context of this study without violating its fidelity, a personal behavior plan
involving tactics that directly target problem behavior within the instructional environment is recommended. For example, given that Evelyn remained on task for very short periods of time (e.g., 5 or 10 seconds), the differential reinforcement of other behavior (DRO) or alternative behavior (DRA) on a short fixed interval (e.g., 5 or 10 seconds) could be utilized. Over time, as Evelyn’s behavior improved the interval could be increased incrementally (e.g., 30 seconds, 1 minute, 2 minutes, etc.) until she remained on task for durations deemed acceptable by her classroom teacher. Additionally, Evelyn may require consequences to be concrete; therefore, the use of a token board could provide her with a visual representation of the consequences that her behavior produces. The use of a token board within the context of a token economy could prove useful in improving her social behavior within the classroom.

Overall, levels of on-task behavior improved over those obtained during baseline for five of the six target participants. A change in the severity of the target participants’ off-task behavior was also seen over time. Initially, the target participants tended to be off task for the entire duration of the intervals, were likely to talk to peers, to leave the location in which instruction was occurring, and to “zone-out” (e.g., had a gossed over look or blank stare and did not respond to instructional stimuli). By the end of the study, a majority of the off-task behavior consisted of quickly glancing away from the instructional materials or the teacher. These improvements were even observed at the end of the school year, a period in which a general pattern of increased off-task behavior is more likely to occur. Therefore, it is unlikely that natural maturation of the target participants produced this increase in on-task behavior.
Students may engage in off-task behavior for several reasons such as to escape an aversive event or to gain attention from a peer or teacher. Demonstrated by the pre-assessment scores, the target participants had skill-based deficits, meaning that these students did not have the necessary skills to successfully perform classroom reading-related activities (Bonfiglio, Daly, Persampieri, & Andersen, 2006). It was hypothesized that if the off-task behavior were due to a skill-based deficit, teaching those reading skills vital to participating during classroom instruction would improve the levels of on-task behavior. The improvement in overall levels of on-task behavior as target participants gained phonics and decoding skills (i.e., following the implementation of the intervention) provides support for the notion that students may engage in off-task behavior as a result of not having the necessary prerequisites to engage in reading activities (i.e., escape).

Additional factors, aside from skill deficits, may have influenced aberrant behavior for Jimmy, Corwin, and Evelyn in particular. Informal observations prior to the start of the study indicated that these target participants engaged in aggressive behaviors (e.g., punching and pinching peers) and might have done so to gain peer attention. However, a more formal analysis (e.g., functional behavior assessment (FBA)) is required to properly evaluate the differentiated role of the function of aberrant behavior on the effectiveness of improving reading skills to increase on-task behavior. It should also be noted that Corwin experienced instability in his home life (e.g., he resided in multiple homes throughout the course of the study), which appeared to coincide with increases in off-task and aggressive behavior. Toward the end of the study, his living situation became more stable and an increase in on-task behavior was also demonstrated.
Although mean and median levels of on-task behavior improved over baseline levels for all target participants, with the exclusion of Evelyn, on-task behavior was generally highly variable. Differences in on-task behavior seemed to be influenced by the specific reading activity. In general, those activities in which students had a greater number of opportunities to respond or to be actively engaged (e.g., reading words on the word wall as a whole group versus one student spelling on the SmartBoard) resulted in higher levels of on-task behavior. This finding is aligned with past research in which increased levels of on-task behavior have been found as a result of providing a higher number of opportunities for active student responses (ASR; Armendariz & Umbreit, 1999; Lambert, Cartledge, Heward, & Lo, 2006; Randolph, 2007).

It is also possible that the high variability in on-task behavior was a result of performance-based deficits (Bonfiglio et al., 2006). In other words, the contingencies in place within the classroom may not have consistently supported the occurrence of appropriate, on-task behavior. For example, frequent and extended periods of down time (i.e., time that instruction was not occurring) occurred throughout the reading instruction period. In addition, inappropriate and off-task behavior was more likely to result in attention from the teacher than appropriate, on-task behavior. The influence of classroom contingencies is also important to consider when examining the relationship between reading achievement and on-task behavior.

**Within-session on-task behavior.** Informal data were also collected during the completion of the Headsprout lessons by marking when a student was off task for more than three consecutive seconds and noting when a prompt was provided to get back on task. A decrease in off-task behavior during lessons for most of the target participants
was demonstrated as they progressed through the Headsprout lessons. In particular, Jimmy demonstrated marked improvements in his behavior from the beginning to the end of the study. Initially, Jimmy engaged in frequent yelling, crying, and other frustration-related behaviors (e.g., slamming the mouse against the table). However, as he progressed through the program, the occurrences of such behaviors became rare. Further, as they progressed through the program both he and Cher were able to successfully complete two Headsprout lessons during one intervention session. For Jimmy, this occurred approximately halfway through the study. At this point, he was able to complete the second lesson without his behavior deteriorating as it had during the beginning stages of the study.

A number of variables may have helped to produce these changes in on-task behavior. First, Headsprout was designed specifically to maintain student engagement and to support increases in reading-related responses, both within and outside the program lessons. For example, instruction is provided so that students have a high probability of experiencing success during each lesson activity; the program teaches skills that are useful outside of the context of the program; and extrinsic consequences (e.g., verbal praise and brief animations) are strategically placed throughout each lesson (Twyman, Strikeleather, Layng, & Hobins, 2003). Second, higher levels of adult supervision during CAI has resulted in behavior improvements for children (Klein, Nir-Gal, & Darom, 2000); thus, it is unknown whether or not improvements in on-task behavior would have been seen had the researcher not provided such close supervision. Third, extrinsic rewards were contingent on completing a Headsprout lesson, which may have increased the likeliness that the target participants stayed on task to complete a
lesson (i.e., to earn a reward). Finally, improved reading skills may have influenced the increase in on-task behavior during intervention sessions as well. Further analysis is necessary to determine which, and the extent to which, each of these variables produced such changes in on-task behavior.

The only target participant who did not demonstrate improvements in on-task behavior was Evelyn. In fact, intervention sessions were terminated on several occasions due to her engagement in noncompliance and work refusal. Based on observations, it appeared that her off-task behavior was both escape- and attention-maintained. The researcher initially attempted to address her off-task behavior within the context of the intervention sessions to allow her to continue the Headsprout lessons; however, her behavior continued to intensify both in frequency and duration. Ultimately, the parameters of this study did not allow for the behavior to be sufficiently handled without interfering with the integrity of the study or further increasing the problem behavior. Therefore, the decision was made to terminate all intervention sessions with Evelyn.

Social Validity

The social validity of this intervention was formally assessed through the use of questionnaires completed by both the classroom teacher and each target participant. Based on the provided responses, both the target participants and the classroom teacher found Headsprout to be an effective and fun program to increase both the reading skills and on-task behavior for students experiencing deficits in both areas. More direct measures, including student behaviors during sessions and continued use of the intervention by school personnel following the termination of the study, to assess social validity have also been suggested (Cooper et al., 2007). Based on similar measures, this
intervention was deemed to have high social validity. When the researcher entered the room, all target participants requested to complete a lesson and each one complained when he or she could not go on the computer immediately (e.g., had to complete Sprout Cards before moving onto the next lesson), or was told to wait until another target participant completed a lesson. Additionally, following the implementation of the intervention, the classroom teacher acknowledged that she noticed improvements in Zora’s, Cher’s, and Jimmy’s behavior within her classroom. Moreover, the SSIS assessment data, completed by the classroom teacher, corresponded to the results of this study, which demonstrated an improvement in on-task behavior (i.e., direct observation during on-task observations). The classroom teacher also stated that she was interested in using the Headsprout Early Reading program (www.headsprout.com) with her students the following school year. She asked the researcher for information regarding the program, including how to purchase it for her school. Finally, as a result of this intervention, the target participants demonstrated an increase in reading achievement, whereas the comparison peer demonstrated a decrease on the post-test compared to the pre-test; thus showing this intervention to be socially valid for improving the reading skills of at-risk Kindergarteners.

Limitations and Future Research

This study extended the literature base and addressed some limitations of past research; however, some limitations of its own exist. First, although the number of target participants included in this study was adequate to demonstrate compelling results within a single-subject research design model, the small number of participants makes it difficult to generalize these findings to that of the larger population. Moreover, only two students
were recommended to serve as a comparison peer and parental permission was obtained for only one of these two students; therefore, only one student served as the comparison peer. Additionally, due to a high number of student absences and the school year ending, only one target participant completed all of the first 40 lessons of the Headsprout Early Reading program (www.headsprout.com). Therefore, the possible gains that target participants could have made are unknown.

Second, Headsprout was not compared to another instructional tool and therefore, determinations regarding the effectiveness of Headsprout compared to other reading interventions cannot be made. It is possible that providing other types of supplemental instruction would have proven beneficial at improving the reading skills and on-task behavior of students with concomitant deficits in both reading and social skill areas. Future research should evaluate the effectiveness of Headsprout compared to other interventions.

Similarly, given the many components of the intervention, it is impossible to determine which components were necessary to produce the positive gains in reading achievement. It is possible that the instruction provided during the computer lesson, the supplemental Sprout Card instruction, the feedback provided during the sessions, exposure to the Headsprout readers, or a combination of any two or more of these was beneficial. This is an empirical question that should be examined in future research. The determination of those components necessary to produce marked changes in reading performance is vital to determining those reading interventions that are most efficacious.

Fourth, although it has been recommended that computer and classroom instruction coincide, this study, as many others before it, did not implement this
suggestion (Torgesen et al., 2010). Rather, this study more similarly emulates the way Headsprout is often used within schools (www.headsprout.com), as it was utilized to supplement the literacy instruction provided by the general education classroom.

Fifth, it must be noted that the Headsprout program is structured in a way that allows continued practice of a skill after a student has demonstrated mastery. In other words, after a target has been introduced, it will continue to be reviewed periodically throughout the remainder of the lessons. Although judicious review is vital to sound reading instruction, it makes it difficult to assess the maintenance of skills in the absence of practice. Given that target participants had the opportunity to respond to previously learned instructional targets and to receive feedback on such responses, both from the computer program and the researcher, it can be argued that skill maintenance was not actually assessed in this study.

Finally, a few limitations exist pertaining to the examination of the relationship between reading skills and social skills. In this study, a functional relation between the improvement of reading skills and increased levels of on-task behavior was not demonstrated. Additionally, the on-task observations occurred for short periods of time (i.e., 5 minutes) and did not necessarily represent levels of on-task behavior during the rest of the instructional period. Future research needs to examine if a functional relation, as opposed to one of correlation, exists between improved reading skills and improved social behavior. More formal analyses on the differential effects of the function of off-task behavior should also be conducted.

**Future research.** Computer-based instruction was recommended as an effective instructional strategy by the NRP (2000) and has been shown to increase literacy skills
for young, at-risk students (e.g., Mioduser, Tur-Kaspa, & Leitner, 2000). However, a paucity of research on computer-assisted instruction exists; therefore, further research in general is needed. More specifically, contradicting evidence exists regarding the utility of CAI for improving the skills of the lowest performers (e.g., Blok et al., 2002; Cassady & Smith, 2004). This study supports that computer programs that utilize those strategies deemed effective to teach reading can increase the reading skills of students at risk of experiencing reading failure, but future research should continue to examine this question.

Those elements of computer-based instruction that produce positive results must also be determined. For example, computers can be programmed to allow for more individualized instruction, provide immediate feedback to student responses, and modify instruction as needed. Although these are cornerstones of effective instruction, they are not always present in classroom instruction. Therefore, there may not be anything inherent in the computer that produces positive results, but rather that some computer programs utilize effective teaching strategies better than some classroom teachers.

Dynarski and colleagues (2007) called for more research on CAI implemented by well-trained facilitators, as opposed to teachers who may have received limited implementation training. Contrarily, based on the review of the literature performed for this study, it is recommended that more research also be conducted with the teacher or other school personnel as the main implementer. It is particularly important to conduct controlled studies to evaluate the efficacy of the Headsprout program when implemented by a teacher.
Finally, language plays a key role in learning to read (Chard, Simmons, & Kameenui, 1995) and students with limited language skills often demonstrate greater difficulty acquiring literacy skills. The target participants in this study demonstrated difficulty learning to accurately decode, perhaps as a result of not having the language skills needed to self-correct when segmenting and then blending. Future research could examine the effectiveness of the Headsprout program in isolation compared to the Headsprout program paired with vocabulary instruction.

**Suggestions for Headsprout**

Some of the sounds are difficult to hear and contain an added schwa (Bursack & Damer, 2011). For instance, the /r/ sound is pronounced as /er/ in the program. Further, the enunciations of some of the words are unclear, which caused discrimination difficulties for many of the target participants. For example, the word *sees* often sounds like *seeds*. Also, when the program segments *s-ee-s*, the sound /ee/ is not heard. It is vital that the program teach accurate phoneme-grapheme relations to ensure that students build a strong foundation in phonics. It is also recommended that the program incorporate spelling instruction, and additional emphasis be placed on phonemic awareness and vocabulary skills. Further, it is stated that the program only contains words that are familiar to young children; however, many of the words instructed in the program did not have meaning for the target participants in this study (e.g., reel). The inclusion of phonemic awareness and vocabulary instruction is especially important for those children with less exposure to oral language and who have limited vocabularies. In fact, it might play a major role in the effectiveness of the program for at-risk learners with limited vocabulary skills.
**Classroom Implications**

The results of this study suggest some important implications for the use of computer-assisted instruction (CAI) to teach reading skills within a school environment, providing effective reading instruction to at-risk students, and the use of academic interventions to increase on-task behavior. First, CAI may be particularly beneficial for those schools that cannot afford to supply one-on-one tutors for their struggling readers (Chambers et al., 2011). Further, web-based programs, such as Headsprout, may be more beneficial for schools compared to software programs because they don’t require installation and maintenance. This is especially advantageous for schools located within urban school districts that may not have comprehensive technical support (Comaskey & Savage, 2009). Further, because the program is internet-based, suspended and sick students who cannot attend school, and who have internet access, could continue their reading instruction from home.

Headsprout can be utilized with minimal training, making it an ideal instructional tool for urban school settings, which often have limited resources (Volpe et al., 2011). However, contrary to the program developers’ claims, this program did not function as a stand-alone program for the target participants in this study. Close supervision and immediate feedback by the researcher was required to promote accurate learning and to keep students on task. Based on this study, it appears that those students who do not have strong phonemic awareness skills and who are struggling with learning the alphabetic principle, require a substantial amount of supervision to ensure that errors are not made. Instructional assistants, classroom volunteers, older children who are more skilled readers, and others who are trained to use Headsprout can provide this supplementary
instruction for young children. This would allow the teacher to work with other children who may require additional assistance or to provide small-group instruction to other students in the class.

Students who do not have adequate reading skills often lose content-learning (Montali & Lewandowski, 1996) and are the least likely to engage in reading-related activities (Stanovich, 1998). CAI may help address the Matthew effect by providing these students with additional instructional time and practice on literacy skills (Hall et al., 2000). Headsprout in particular, allows students to make progress quickly and students who experience success with reading are more likely to continue to read. Moreover, a major strength of the Headsprout program is that it is highly engaging, even for the target participants in this study who engaged in high rates of off-task behavior, further increasing the chances that students will begin to enjoy reading.

Research supports the need to provide explicit instruction in decoding skills, especially for young, at-risk learners (NRP, 2000). Many of the target participants initially spelled words when instructed to read them, and continued to do so during the beginning portion of the study. This demonstrates that a short learning history, approximately five months of formal literacy instruction, can come to exert strong control over reading responses, providing further support for the need to provide appropriate and effective literacy instruction from the onset of formal schooling. Additionally, based on the need to provide supplemental explicit instruction using the Sprout Cards, it is possible that Headsprout may not provide explicit enough instruction on segmenting and blending skills. Therefore, it is recommended that Headsprout, and all other CAI, be used in conjunction with strong, effective classroom reading instruction (Cassady & Smith,
Moreover, reading instruction should include programming for generalization and fluency.

Lastly, the positive correlation demonstrated between increased reading skills and improved on-task behavior should inform classroom practices. There is often an added pressure to engage in behavior management in urban schools, especially with those students who engage in aberrant behavior (Gardner & Hsin, 2008). However, these strategies do not necessarily remediate academic deficits, which may be at the root of the problem for many students with concomitant deficits in reading and social skills. The findings of this study suggest that the best tool is to effectively improve reading skills, which results in improved levels of on-task behavior. Ultimately, if the students are better behaved, the opportunities to reinforce appropriate behavior are increased. Despite this suggestion, the claim is not being made that this strategy will work for, or is appropriate, for all students with characteristics similar to the target participants in this study.

Appropriate classroom practices must be based on the needs of the individual students.

**Conclusion**

Children at risk of experiencing reading failure require more intense instruction, beyond the instruction that is generally provided in regular classroom instruction if they are to catch up with their more advantaged peers (Huffstetter et al., 2010). Moreover, students with concomitant deficits in reading and social skills require the most efficacious interventions. Computer-based programs that incorporate those strategies deemed effective in reading instruction in general (e.g., explicit instruction, feedback, repeated practice) can provide intensive reading instruction for struggling readers (Wise et al., 2000), including those who also engage in high rates of off-task behavior (Rabiner et al., 2004).
2010). Additional research is needed to further examine the utility of CAI in teaching literacy skills and improving levels of on-task behavior for those students most at risk of experiencing school failure.
References


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Torgesen, J. K., & Bryant, B. R. (1994). *Phonological awareness training for reading*. Austin, TX: ProEd.


APPENDIX A: PARENTAL PERMISSION FORM
The Ohio State University Parental Permission
For Child’s Participation in Research

The Effect of Precision Teaching and Explicit Instruction on the Reading Skills and Social Deportment of Kindergarten Students

Study Title: The Effect of Precision Teaching and Explicit Instruction on the Reading Skills and Social Deportment of Kindergarten Students

Researcher: a. Ralph Gardner

Sponsor: b.

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate.

Your child’s participation is voluntary.

Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:
The purpose of this study is to determine the effectiveness of explicit reading instruction on reading achievement, increasing on-task behavior, and decreasing off-task behavior during classroom instruction.

Procedures/Tasks:
If you allow your child to participate in this study, he/she will receive instruction on letter sounds and names, sound discrimination skills, and how to effectively sound out words and read passages. Your child will also have opportunities to practice these skills by completing three to five short timings. Your child will complete interactive reading lessons from a program called Headsprout. Headsprout has been shown to effectively increase reading skills of beginning readers. After the Headsprout lesson is completed, short 15-second timings will be completed on the skills taught during the Headsprout lesson. If your child makes a reading error, corrective feedback will be given immediately. Additionally, positive statements regarding your child’s progress will be given throughout the study. At the end of the session, your child will receive a self-selected sticker or pencil for beating previous reading performances. Your child will be asked to complete two reading achievement assessments prior to the beginning of the study and at the end of the study. Each assessment will take 5-15 minutes to complete and will be used to assess your child’s reading grade level. In addition to receiving reading instruction, we will observe your child in his/her general classroom. We will measure levels of on-task and off-task behavior during regular...
reading instruction and one other academic subject area (e.g., math). If your child’s on-task behavior does not improve with our extra reading instruction then we will provide instruction on how to behave during regular classroom instruction. If instruction is necessary, we will model what appropriate classroom behavior looks like and provide explicit verbal instructions on how to behave in the classroom. Additionally, feedback will be provided to your child based on his/her classroom behavior.

If your child participates in this study, you will also be asked to complete a questionnaire; however, the completion of this questionnaire is voluntary. This questionnaire will ask you about your opinion regarding your child’s behavior and reading engagement. The answers provided will not have an affect on your child’s participation in the study and will only be used to assess if any changes have been noticed following your child’s participation in the study.

**Duration:**
This study will last approximately 3 months. During this study, we expect to work with your child three to five days per week for 20-50 minutes per day. The questionnaire that you will be asked to complete should take approximately 5 minutes.

Your child may leave the study at any time. If you or your child decides to stop participation in the study, there will be no penalty and neither you nor your child will lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

**Risks and Benefits:**
We do not anticipate any risks as a result of participating in this study. There is a chance that the study will not be successful at decreasing off-task behavior for all students, but the students will receive extra instruction time as part of the study.

The main anticipated benefit of this study is that we will identify a means of increasing reading achievement and on-task behavior during classroom instruction by increasing performance on various reading skills. Your child will benefit from receiving extra instruction on reading skills and may also be more likely to stay on-task during classroom instruction; therefore, your child will be more likely to be successful within his/her classroom environment. Determining the relationship between performance on academic skills and behavior in the classroom would be extremely beneficial for both students and classroom teachers.

**Confidentiality:**
Efforts will be made to keep your child’s study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your child’s participation in this study may be disclosed if required by state law. Also, your child’s records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
• The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
• The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Incentives:
Your child may earn small rewards, such as stickers and pencils, for reaching reading goals during the session.

Participant Rights:
You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you or your child is a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:
For questions, concerns, or complaints about the study you may contact Ralph Gardner at 614-292-3308 or gardner.4@osu.edu.

For questions about your child’s rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If your child is injured as a result of participating in this study or for questions about a study-related injury, you may contact Ralph Gardner at 614-292-3308 or gardner.4@osu.edu.

Signing the parental permission form
I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.
**Printed name of subject**

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**Printed name of person authorized to provide permission for subject**

**Signature of person authorized to provide permission for subject**

**Relationship to the subject**

**Date and time**

---

**Investigator/Research Staff**

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

---

**Printed name of person obtaining consent**

**Signature of person obtaining consent**

**Date and time**

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APPENDIX B: CHILD ASSENT
Hello ____________________.

I have to do a project for school and I want to learn how to teach kids how to read and how to stay on-task and pay attention in class. I was hoping that you would help me out.

If you want to participate, we will work on some different reading skills, such as learning what sound a letter makes and how to read words. We’re also going to do some timings where you will try to say as many answers as you can before the timer goes off.

You do not have to participate. You should only do this if you really want to. Even if you do say that you want to help me with my project, you can change your mind at any time. If you tell me that you no longer want to participate then you will not have to.

Do you want to work on this project?
APPENDIX C: AIMSWEB TESTS OF EARLY LITERACY SAMPLES
K B F U M f S W D L / 10 (10)
i j l L n r f S s Y / 10 (20)
D I C e f l Y d P N / 10 (30)
u z f Z o j D h N J / 10 (40)
c J k A l d q f j g / 10 (50)
z P O p o V N Y l u / 10 (60)
o t G W S L c I J n / 10 (70)
q X v A Y w W V m c / 10 (80)
g f l w V s Y O m X / 10 (90)
R p T i U s N w k h / 10 (100)
Given To: ___________________________  Given By: ___________________________  Date: ____________

a i j w c n y g e b / 10 (10)

l i v d p o h m g k / 10 (20)

k y n f w m e a p u / 10 (30)

n i p y d w l b f o / 10 (40)

i z s n p g d l f w / 10 (50)

b f c d o v k s r w / 10 (60)

s r o u y m n h l i / 10 (70)

v k m o z y b j t l / 10 (80)

f n c s m u b h d z / 10 (90)

g i z h y w j o m b / 10 (100)
guide /g/ /ie/ /d/ clear /k/ /l/ /ea/ /r/ / 7 (7)
drove /d/ /rl/ /oa/ /vl/ creek /k/ /rl/ /ea/ /lk/ / 8 (15)
few /fl/ /yl/ /oo/ grow /g/ /rl/ /oa/ / 6 (21)
hit /h/ /i/ /tl/ yell /yl/ /el/ /l/ / 6 (27)
shot /sh/ /ol/ /tl/ quick /k/ /wl/ /il/ /k/ / 7 (34)
fun /fl/ /ul/ /nl/ room /rl/ /oo/ /ml/ / 6 (40)
smoke /s/ /ml/ /oa/ /kl/ won /wl/ /ul/ /nl/ / 7 (47)
sir /s/ /irl/ thick /th/ /il/ /kl/ / 5 (52)
whom /h/ /ool/ /ml/ named /n/ /ai/ /ml/ /dl/ / 7 (59)
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<td>hij</td>
<td>mej</td>
<td>15 (58)</td>
</tr>
<tr>
<td>wol</td>
<td>pum</td>
<td>yul</td>
<td>soj</td>
<td>nom</td>
<td>15 (73)</td>
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<tr>
<td>loz</td>
<td>vel</td>
<td>zec</td>
<td>sab</td>
<td>vom</td>
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</tr>
<tr>
<td>zog</td>
<td>kam</td>
<td>pog</td>
<td>jut</td>
<td>rel</td>
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</tr>
<tr>
<td>uf</td>
<td>ag</td>
<td>fot</td>
<td>jok</td>
<td>rud</td>
<td>13 (116)</td>
</tr>
<tr>
<td>lis</td>
<td>hez</td>
<td>paj</td>
<td>sus</td>
<td>doz</td>
<td>15 (131)</td>
</tr>
<tr>
<td>yuf</td>
<td>sif</td>
<td>zif</td>
<td>dov</td>
<td>rol</td>
<td>15 (146)</td>
</tr>
<tr>
<td>yub</td>
<td>riz</td>
<td>es</td>
<td>neg</td>
<td>kes</td>
<td>14 (160)</td>
</tr>
<tr>
<td>lac</td>
<td>tuj</td>
<td>hef</td>
<td>kat</td>
<td>tat</td>
<td>15 (175)</td>
</tr>
<tr>
<td>ruz</td>
<td>fek</td>
<td>vaj</td>
<td>muc</td>
<td>vak</td>
<td>15 (190)</td>
</tr>
<tr>
<td>sid</td>
<td>liv</td>
<td>zal</td>
<td>zon</td>
<td>ug</td>
<td>14 (204)</td>
</tr>
<tr>
<td>nib</td>
<td>hej</td>
<td>riv</td>
<td>het</td>
<td>taj</td>
<td>15 (219)</td>
</tr>
</tbody>
</table>
APPENDIX D: RANDOMIZED LIST OF PROGRESS MONITORING PROBES
1. Progress Monitoring Probe #19
2. Progress Monitoring Probe #31
3. Progress Monitoring Probe #30
4. Progress Monitoring Probe #9
5. Progress Monitoring Probe #28
6. Progress Monitoring Probe #24
7. Progress Monitoring Probe #20
8. Progress Monitoring Probe #6
9. Progress Monitoring Probe #4
10. Progress Monitoring Probe #13
11. Progress Monitoring Probe #17
12. Progress Monitoring Probe #16
13. Progress Monitoring Probe #26
14. Progress Monitoring Probe #18
15. Progress Monitoring Probe #22
16. Progress Monitoring Probe #8
17. Progress Monitoring Probe #29
18. Progress Monitoring Probe #11
19. Progress Monitoring Probe #27
20. Progress Monitoring Probe #33
21. Progress Monitoring Probe #21
22. Progress Monitoring Probe #32
23. Progress Monitoring Probe #12
24. Progress Monitoring Probe #15
25. Progress Monitoring Probe #7
26. Progress Monitoring Probe #10
27. Progress Monitoring Probe #5
28. Progress Monitoring Probe #23
29. Progress Monitoring Probe #25
APPENDIX E: HEADSPROUT PRE- AND POST-ASSESSMENT TARGETS
<table>
<thead>
<tr>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sounds</td>
</tr>
<tr>
<td>Words</td>
</tr>
</tbody>
</table>
APPENDIX F: HEADSPROUT SAMPLE SCREEN PRINT
APPENDIX G: SPROUT CARD SAMPLE
APPENDIX H: SPROUT STORY SAMPLES
I've finished Episode 5!
I can read this story!
APPENDIX I: HEADSPROUT PROGRESS MAP
APPENDIX J: TREATMENT INTEGRITY CHECKLISTS
Headsprout Lesson

<table>
<thead>
<tr>
<th>Instructional Step</th>
<th>Checkmark if completed and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A student sits at a computer with Headsprout, a mouse, and headphones.</td>
<td></td>
</tr>
<tr>
<td>The researcher tells the student “to follow the directions given by the computer”</td>
<td></td>
</tr>
<tr>
<td>The researcher allows the student to complete the lesson as independently as possible.</td>
<td></td>
</tr>
<tr>
<td>The researcher notes off-task behavior (if applicable)</td>
<td></td>
</tr>
<tr>
<td>The researcher prompts the student to get back on task/ provides assistance if necessary.</td>
<td></td>
</tr>
<tr>
<td>The student completes a lesson (if the student does not complete a lesson, it is restarted the following session)</td>
<td></td>
</tr>
<tr>
<td>The student reads a Sprout Story when applicable.</td>
<td></td>
</tr>
<tr>
<td>The researcher conducts the appropriate Headsprout probes (if the student completed an odd lesson).</td>
<td></td>
</tr>
<tr>
<td>The student places a sticker on the progress map for the completed lesson.</td>
<td></td>
</tr>
<tr>
<td>The student selects a small reward and returns to class.</td>
<td></td>
</tr>
</tbody>
</table>
### Headsprout Probe Treatment Integrity Checklist

<table>
<thead>
<tr>
<th>Instructional Step</th>
<th>Checkmark if completed and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The researcher shuffles the deck prior to presenting the first target.</td>
<td></td>
</tr>
<tr>
<td>The researcher tells the student “to read the word when you see a word and say the sound when you see the letters.”</td>
<td></td>
</tr>
<tr>
<td>The researcher presents the first target (flashcard).</td>
<td></td>
</tr>
<tr>
<td>The researcher starts the timer when the participant makes his/her first response.</td>
<td></td>
</tr>
<tr>
<td>The researcher presents the next flashcard following the participant’s response until the participant has responded to all of the flashcards in the deck.</td>
<td></td>
</tr>
<tr>
<td>The researcher records the targets responded to correctly.</td>
<td></td>
</tr>
<tr>
<td>The researcher stops the timer after the participant responds to the last flashcard.</td>
<td></td>
</tr>
<tr>
<td>The researcher records the timing length and the number of correct responses.</td>
<td></td>
</tr>
<tr>
<td>The researcher provides neutral feedback.</td>
<td></td>
</tr>
<tr>
<td>The researcher does not allow the participant to see the timing length.</td>
<td>177</td>
</tr>
</tbody>
</table>
On-Task Behavior Observation Treatment Integrity Checklist

<table>
<thead>
<tr>
<th>Instructional Step</th>
<th>Checkmark if completed and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student 1</td>
</tr>
<tr>
<td>The observer sits in a position so that she can clearly see the student.</td>
<td></td>
</tr>
<tr>
<td>The observer observes during a reading related activity and notes the activity on the data sheet.</td>
<td></td>
</tr>
<tr>
<td>The observer sets the MotiVaider for 4 second intervals (with shortest vibrate interval).</td>
<td></td>
</tr>
<tr>
<td>The observer does not engage with the students in the class or react to them in any way.</td>
<td></td>
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<tr>
<td>If the student looks at the observer, the observer avoids eye contact.</td>
<td></td>
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<tr>
<td>The observer takes data using the data sheet for each interval.</td>
<td></td>
</tr>
<tr>
<td>The observer notes the off-task behavior that the student engages in.</td>
<td></td>
</tr>
<tr>
<td>The observer collects data for 5 minutes.</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX K: HEADSPROUT LESSON RECORDNG SHEET
<table>
<thead>
<tr>
<th>Date</th>
<th>Condition/ HS Lesson</th>
<th>Prompts</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
APPENDIX L: SSIS TEACHER’S FORM
Instructions
This booklet contains statements describing a student’s behavior and level of academic performance. It consists of three parts: Social Skills, Problem Behaviors, and Academic Competence.

Social Skills & Problem Behaviors
Please read each item and think about this student’s behavior during the past two months. Then, decide how often this student displays the behavior.

- If this student never exhibits the behavior, circle the N.
- If this student seldom exhibits the behavior, circle the S.
- If this student often exhibits the behavior, circle the O.
- If this student almost always exhibits the behavior, circle the A.

For each of the Social Skills items, please also rate how important you think the behavior is for success in your classroom.

- If you think the behavior is not important for success in your classroom, circle the n.
- If you think the behavior is important for success in your classroom, circle the i.
- If you think the behavior is critical for success in your classroom, circle the c.

Academic Competence (for students from kindergarten through Grade 12)
Please assess this student’s academic or learning behaviors in your classroom. Compare this student with other students in the same classroom.

Mark all items using a scale of 1 to 5. Mark "1" if this student is in the lowest 10% of the class. Mark "5" if this student is in the highest 10% of the class.

How to Mark Your Responses
When marking responses, use a sharp pencil or ballpoint pen; do not use a felt-tip pen or marker. Press firmly, and be certain to circle completely the letter you choose, like this:

If you wish to change a response, mark an X through it, and circle your new choice, like this:

Please mark every item. In some cases, you may not have observed this student perform a particular behavior. If you are uncertain of your response to an item, give your best estimate. There are no right or wrong answers.

Before starting, be sure to complete the information in the boxes on the right-hand side of page 3.
APPENDIX M: ON-TASK OBSERVATION DATA RECORDING SHEET
**On-task behavior:** behaviors necessary to promote learning
1. the student looking at the instructional material or the teacher
2. responding appropriately to the material, peers, or teacher

**Off-task behavior:** behaviors that interfere with the individual’s learning (defined based on each target participant)
1. 
2. 
3. 
4.

**Disruptive:** behaviors that impede the learning of other students (defined based on each target participant)
1. 
2. 
3. 
4.
APPENDIX N: SOCIAL VALIDITY QUESTIONNAIRES
<table>
<thead>
<tr>
<th>Questionnaire for Parent Post-Intervention</th>
<th>Agree</th>
<th>Somewhat Agree</th>
<th>No Opinion</th>
<th>Somewhat Disagree</th>
<th>Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>My child <em>enjoys</em> reading more than he/she use to.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My child reads more now than he/she use to.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>My child is more likely to try to sound words out when he/she reads.</td>
<td></td>
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</tr>
<tr>
<td>My child can sit for a longer time when working on school activities/ homework.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My child follows direction at home</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I think using a computer program is a good way to teach reading.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I would use a computer program to help my child learn to read.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Please explain your answer above</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questionnaire for Teacher Post-Intervention</td>
<td>Agree</td>
<td>Somewhat Agree</td>
<td>No Opinion</td>
<td>Somewhat Disagree</td>
<td>Disagree</td>
</tr>
<tr>
<td>--------------------------------------------</td>
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<td>------------</td>
<td>-------------------</td>
<td>----------</td>
</tr>
<tr>
<td>I believe the intervention successfully increased the student's reading skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I believe the intervention positively impacted the student's problem behavior during reading instruction</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I believe the intervention positively impacted the student's behavior during activities not related to reading</td>
<td></td>
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</tr>
<tr>
<td>I found the intervention appropriate to increase student reading skills</td>
<td></td>
<td></td>
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<tr>
<td>I found the intervention appropriate to deal with the student's problem behavior</td>
<td></td>
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</tr>
<tr>
<td>I would use this intervention to increase reading skills</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I would use this intervention to decrease problem behavior</td>
<td></td>
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</tr>
<tr>
<td>I believe the intervention would be easy to implement within my classroom</td>
<td></td>
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</tr>
<tr>
<td>Questionnaire for Student Post-Intervention</td>
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<tr>
<td>-------------------------------------------</td>
<td>--</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headsprout was fun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headsprout helped me learn to read better</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headsprout helped me follow directions during reading class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Headsprout helped me listen better during reading class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I like to read</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Likes and Dislikes of Headsprout:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>