Using Systematic and Engaging Early Literacy Instruction and Digital Books to Teach At-Risk Kindergarteners to Read Target Words

Audra Marie Hales
Brigham Young University - Provo

Follow this and additional works at: https://scholarsarchive.byu.edu/etd

Part of the Communication Sciences and Disorders Commons

BYU ScholarsArchive Citation
Hales, Audra Marie, "Using Systematic and Engaging Early Literacy Instruction and Digital Books to Teach At-Risk Kindergarteners to Read Target Words" (2012). All Theses and Dissertations. 3468.
https://scholarsarchive.byu.edu/etd/3468

This Thesis is brought to you for free and open access by BYU ScholarsArchive. It has been accepted for inclusion in All Theses and Dissertations by an authorized administrator of BYU ScholarsArchive. For more information, please contact scholarsarchive@byu.edu, ellen_amatangelo@byu.edu.
Using Systematic and Engaging Early Literacy Instruction and Digital Books to Teach At-Risk Kindergarteners to Read Target Words

Audra Hales

A thesis submitted to the faculty of Brigham Young University in partial fulfillment of the requirements for the degree of Master of Science

Barbara Culatta, Chair
Martin Fujiki
Kendra Hall-Kenyon
Blake Hansen

Department of Communication Disorders Brigham Young University
November 2012

Copyright © 2012 Audra Hales
All Rights Reserved
ABSTRACT

Using Systematic and Engaging Early Literacy Instruction and Digital Books to Teach At-Risk Kindergarteners to Read Target Words

Audra Hales
Department of Communication Disorders
Master of Science

The purpose of this study was to examine the effects of using Systematic and Engaging Early Literacy (SEEL) intervention activities that incorporate digital books to teach kindergarteners to read. The study used a single-subject-multiple-baseline-across-behaviors design to compare kindergarten students’ reading of comparable CVC words before and after intervention. Four students at-risk for reading difficulties were chosen for the study based on their performance on assessments and their teachers’ recommendations. Students were divided into two dyads and received intervention three times a week for 25 minutes for approximately six weeks, or 18 total sessions. Baseline assessment data was collected prior to intervention, and performance on each target was monitored through the same assessment task after every intervention session. Students received SEEL instruction on one set of word targets while a comparable set was kept at baseline phase. After six intervention sessions on the first set of word targets, a second set was introduced while the first set was monitored for maintenance. Finally, a third set of target words was introduced and taught in six sessions, and the first two sets of words were monitored for maintenance.

Instruction involved using meaningful and interactive activities that incorporated playful practice, multiple exposures to targets, explicit statement of the goal, and reciprocal teacher-student exchanges where students’ contributions were acknowledged and incorporated into the lesson or meaning construction. After being exposed to the target words (orally and in writing), children were provided with additional opportunities to read and write the words within digital books created on the iPad.

Keywords: reading, CVC words, iPad, kindergarten, single-subject design
# Table of Contents

List of Tables ............................................................................................................................ v

Introduction.................................................................................................................................. 1

Review of Literature .................................................................................................................. 3

Explicit Teaching of Early Literacy Skills ............................................................................. 3

Elements of Engaging and Meaningful Instruction ............................................................. 7

Use of Technology to Increase Frequency of Instruction .................................................... 13

Purpose of Study ..................................................................................................................... 17

Method ........................................................................................................................................ 17

Participants .............................................................................................................................. 17

Design ......................................................................................................................................... 20

Procedures ............................................................................................................................... 21

Measures ..................................................................................................................................... 27

Data analysis ............................................................................................................................. 30

Treatment Fidelity ..................................................................................................................... 31

Results ........................................................................................................................................ 34

Individual Student Performance on Word Reading .............................................................. 34

Student Engagement During Instruction ......................................................................... 48

Discussion .................................................................................................................................. 53

Factors Impacting Student Performance .............................................................................. 53
Possible Factors Influencing Student Engagement ....................................................... 55
Recommendations for Integrating Technology into Early Literacy Instruction ........... 59
Limitations .................................................................................................................... 61
Future Research ............................................................................................................ 64
References ............................................................................................................................... 67
Appendices .............................................................................................................................. 74
List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Words Taught to Students</td>
<td>28</td>
</tr>
<tr>
<td>Alyssa’s Mean, Standard Deviation, and Range for all Targets, During Each Phase</td>
<td>37</td>
</tr>
<tr>
<td>Tavigk’s Mean, Standard Deviation, and Range for all Targets, During Each Phase</td>
<td>41</td>
</tr>
<tr>
<td>Steven’s Mean, Standard Deviation, and Range for all Targets, During Each Phase</td>
<td>44</td>
</tr>
<tr>
<td>Jared’s Mean, Standard Deviation, and Range for all Targets, During Each Phase</td>
<td>47</td>
</tr>
<tr>
<td>Percentage of Each of the Behaviors in the DBR for Alyssa</td>
<td>49</td>
</tr>
<tr>
<td>Percentage of Each of the Behaviors in the DBR for Tavigk</td>
<td>50</td>
</tr>
<tr>
<td>Percentage of Each of the Behaviors in the DBR for Steven</td>
<td>51</td>
</tr>
<tr>
<td>Percentage of Each of the Behaviors in the DBR for Jared</td>
<td>52</td>
</tr>
</tbody>
</table>
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alyssa’s results for –ot, –og and –ap targets</td>
<td>35</td>
</tr>
<tr>
<td>Tavigk’s results for –ot, –og and –ap target</td>
<td>39</td>
</tr>
<tr>
<td>Steven’s results for –ot, –og and –ap targets</td>
<td>42</td>
</tr>
<tr>
<td>Jared’s results for –ot, –og and –ap targets</td>
<td>46</td>
</tr>
<tr>
<td>Appendix</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Informed Consent</td>
<td>74</td>
</tr>
<tr>
<td>Photo Release</td>
<td>76</td>
</tr>
<tr>
<td>Assessment Check Sheet</td>
<td>77</td>
</tr>
<tr>
<td>Raw Data</td>
<td>78</td>
</tr>
<tr>
<td>DBR Standard Form</td>
<td>82</td>
</tr>
<tr>
<td>SEEL Treatment Fidelity Check Sheet</td>
<td>83</td>
</tr>
</tbody>
</table>
**Introduction**

Many students struggle to acquire fundamental literacy skills that are important for academic success. Regular classroom instruction may not be sufficient for some children, especially those who are at-risk for reading difficulties. These at-risk students require scaffolding and high quality instruction beyond the regular classroom (Verhoeven & Snow, 2001). Studies have shown that at-risk and low-achieving students need more time, practice, and intensive experiences to acquire reading and writing skills. Supplemental high-quality instruction used to increase student exposure to literacy and provide them with additional opportunities to practice relevant literacy skills, helps increase student engagement and success in learning to read. High-quality intervention in various forms should allow students greater access to learning (McGee & Richgels, 2004; Verhoeven & Snow, 2001). Technology is one way of providing students with supplemental learning opportunities within the classroom.

Technology has been introduced in education to help provide struggling students with additional literacy experiences and practice. In today’s society, children are exposed to technology in a variety of forms, and technology has become a significant motivator for children through its role in communication, entertainment, and education. Children today are engaged and competent in the use of many technologies including computers, cell phones, video games, digital cameras, and MP3s. These technologies are shaping the way children learn and interact with their environment. In light of these changes, the use of electronics in the classroom is becoming increasingly prevalent. A number of studies demonstrate how manipulating the use of electronics in the classroom can increase students’ participation, motivation, and literacy skills (Gonzalez, 2011; Korat & Or, 2010; Larson, 2010; Levy, 2009; Segal-Drori, Korat, Shamir, & Klein, 2010; Shamir, 2009; Shamir & Korat, 2007; Shamir & Shlafer, 2011; Shiratuddin &
Favorable results among these studies indicate that technology, specifically the use of digital books, can be used as an additional aid in teaching children to read. However, there is a need to look at the impact of supplementing existing hands-on literacy lessons with opportunities to read and write via digital books.

Despite the fact that technology has advantages, there are some concerns about using technology-driven instruction with young children. Educators must be cautious in how technology is presented to children and steps must be taken to ensure that the use of technology maintains quality and efficacy in academic instruction (Marsh, 2009). The National Association for the Education of Young Children warns that technology can negatively impact academic development if used as a replacement for active play, engagement, and interaction with others. They advise educators to integrate age and developmentally appropriate technology into early literacy instruction to support learning goals for children (NAEYC, 2012). Technology can be successfully used in the classroom as it is blended with face-to-face interactions.

The purpose of this study was to examine the effects of supplementing existing Systematic and Engaging Early Literacy (SEEL) activities with additional reading and writing practice via digital books. SEEL is an early literacy program designed to teach children in engaging and explicit ways. The hands-on activities, drawn from the SEEL website, served to introduce literacy target words in contexts that stimulate engagement and meaning, while digital books were used to provide follow-up opportunities to practice reading and writing phonemic patterns. The study specifically looked at the impact of SEEL instructional activities with reading and writing practice delivered through iPad® digital books on the abilities of four kindergarten students to read consonant-vowel-consonant (CVC) words. Each of the students in the study had attended kindergarten for six months and had been previously instructed in reading
CVC words through regular classroom instruction and SEEL activities. However, these students continued to show little progress and were significantly behind their peers in their ability to read short vowel words.

**Review of Literature**

Large numbers of children from all social classes have considerable reading difficulties, and today 33% of the nation’s fourth graders performed at a below-basic reading level (NAEP, 2011). Reading is challenging for many of the nation’s children, and for 20–30% of students it is one of the most difficult tasks they face in school (NICHD, 2000). Students who are at-risk for reading difficulties need specific intervention in which instructors explicitly teach important literacy skills, keep children engaged, and increase opportunities for practice.

**Explicit Teaching of Early Literacy Skills**

Effective literacy instruction should be centered on the explicit teaching of important skills. Early literacy instruction should be explicit in that teachers communicate clear goals, and children are aware of what it is that they are learning. In explicit instruction the teacher clearly states the objective, models the desired behavior, and provides students with frequent opportunities to practice the skill being taught (Bingham, Hall-Kenyon, & Culatta, 2012; Culatta & Hall, 2006; Justice & Kaderavek, 2004; Korth, Sharp, & Culatta, 2010; Mesmer & Griffith, 2005; Neuman & Dickinson, 2001; Stein, Johnson, & Gutlohn, 1999). Such explicit teaching helps maintain children’s attention and enables more effective learning and retention (Adams, 1990; Baker, Dreher, & Guthrie, 2000; Justice & Kaderavek, 2004; Verhoeven & Snow, 2001).

Researchers advocate that two primary skills should be addressed in the explicit instruction of early literacy: phonological awareness and phonics. Phonological awareness and phonics skills are predictive of reading success, and instruction in these areas provides the

**Phonological awareness.** In order to be basic readers and writers at the end of kindergarten, children need to acquire phonological awareness skills. Phonological awareness is the awareness that words are composed of smaller units of sounds (Adams, 1990; Roth & Baden, 2001; Stahl & Murray, 2006); and it is the ability to identify and manipulate sounds in words. With this skill, children can learn to take apart the sounds in words and then put them back together again.

Components of phonological awareness include alliteration, rhyming, sound identification, blending and segmenting, and manipulating (Stahl & Murray, 2006). *Alliteration* is awareness of the repetitive use of a particular sound in the initial position in words. Exposure to alliteration phrases and sensitivity to initial sounds in words can lead to children attend to the initial sounds in words and can prepare children to sort words (represented with objects or pictures) according to the same sound.

Children’s phonological awareness is also developed through rhyming. Rhyming is the ability to recognize or generate words with same rime endings (same vowel and final consonant). It involves the repetition of similar sounds in words and attention to the sounds of word endings. Rhyming skills enable children to point out the sound of rhyme endings, identify rhyme pairs, and generate novel rhyme words or words that belong to a rhyme family.

In addition to rhyming, children develop phonological awareness through the skill of sound identification. *Sound identification* pertains to the ability to identify sounds heard in words. Identification of sounds requires the recognition and categorization of the initial, medial, or final sound heard in words. Children acquire the ability to say what sound is heard in various
positions in words (e.g., what sound does the word ‘book’ start with?), think of a word that starts with a particular sound (e.g. think of a word that starts with /b/), and sort words according to identical (or particular) initial, medial, or final sounds.

Sound blending, segmenting, and manipulating requires children to be able to separate and identify the individual sounds composing a word and blend the sounds into words. Finally, children can use these skills to manipulate the use of sounds through substitution and deletion of syllables or sounds in words (McGee & Richgels, 2004; Roth & Baden, 2001; Stahl & Murray, 2006; Whitehurst & Lonigan, 2001). A combination of phonological awareness tasks including sound blending, segmenting, and manipulation as well as rhyming, alliteration, and sound identification may be used to help children develop foundational literacy skills (Stahl & Murray, 2006). The attainment of phonological awareness skills is strongly correlated with reading achievement and is the most prominent predictor of early literacy and reading acquisition (Adams, 1990; Stanovich, 1986; Wagner & Torgesen, 1987; Whitehurst & Lonigan, 2001).

While children are aware of sounds, most will need formal instruction to help them break down words into the sounds that compose them (Owens, 2008; Whitehurst & Lonigan, 2001). Adequate and appropriate instruction in this area must be provided to help children succeed in learning to read (Snow, Burns, & Griffin, 1998). Phonological-awareness training in emerging readers will help to heighten their awareness to sound segments that function to create words.

Phonological awareness can be stimulated through rhyming and alliteration activities using games, nursery rhymes, and shared reading experiences (Roth & Baden, 2001). These rhyming and alliteration activities should be a fun and engaging way for children to play with sounds. Instructors can help children advance from sound play and rhyming to the blending of onset and rime (e.g. h-op, t-op), to even higher-level skills of identifying and isolating individual
sounds. When children become aware of the individual sounds that compose words, they can develop the ability to blend, segment, and manipulate sounds in words (Stahl & Murray, 2006).

Explicit phonological awareness instruction helps children develop sensitivity to the sound composition of words (Snow et al., 1998). Explicit phonological awareness instruction provides children with frequent models and support to encourage sound play and assisted practice blending and segmenting words. Because the skill of phonological awareness requires children to be able to notice the sound patterns being taught, intense modeling from the adult is important. Through frequent and explicit adult models, children are provided with multiple exposures and frequent opportunities to practice phonological awareness skills. As beginning readers develop the ability and confidence to manipulate and play with sounds auditorially, they are better able to attach the sounds to letters in print (Whitehurst & Lonigan, 2001).

**Phonics.** In addition to phonological awareness, effective phonics instruction is central to learning to read (Stahl & Murray, 2006; Whitehurst & Lonigan, 2001). Phonics, or attaching sounds to printed letters, is an important skill for beginning readers (Stein, Johnson, & Gutlohn, 1999). Phonics skills include the ability to decode words by sounding out individual phonemes, identify the sounds that correspond to written letters, and use written letters to create words.

Although children have a natural propensity to use and hear phonemes orally, they need direct phonics instruction to teach them to isolate the sounds in words, associate graphemes with the sounds they represent, and blend the sounds together (Adams, 1990; Eldredge, 2005). Phonics instruction teaches children to make letter-sound associations and recognize patterns in words, including the relationships between letter patterns and spelling patterns, so that they can use their letter-sound knowledge to decode words in print (Gates & Yale, 2011; Smith, 1998; Stahl, 1992; Stein et al., 1999).
Phonics instruction is best delivered explicitly in which instruction is structured, predictable, and clear. Explicit phonics instruction requires direct teaching and planning, student participation and practice, and ongoing assessment to ensure that the instruction is effective (Gates & Yale, 2011; Mesmer & Griffith, 2005; Stahl, 1992; Starrett, 2006). In explicit phonics instruction, the teacher states the objective, models and emphasizes the skill, and provides multiple opportunities to practice.

A study conducted by Vadasy (2010) demonstrated the effectiveness of explicit phonics instruction principles for kindergarteners at-risk for reading difficulties. The students received individual systematic and explicit phonics instruction focusing on a number of phonics skills. The author found that explicit phonics instruction involving letter-sound correspondence and decoding words had a positive effect on the students’ early literacy skills. Explicit phonics instruction successfully teaches students, especially those at-risk for reading difficulties, fundamental reading skills that lead to academic achievement and reading success (Adams, 1990; Smith, 1998; Stahl, 1992; Starrett, 2006).

In addition to the clear and direct teaching of phonics, instruction should also be engaging and meaningful to students to help them in their acquisition of these skills (Gates & Yale, 2011; Mesmer & Griffith, 2005; Stahl, 1992). As teachers implement instruction focused on developing phonological awareness and phonics skills in explicit ways, they must also consider the manner in which instruction is delivered. Strategic manipulation of instruction can motivate students to learn to read and increase their attainment of important literacy skills.

**Elements of Engaging and Meaningful Instruction**

Instructors have the challenge of providing instruction that engages and encourages young readers to use and practice skills. Literacy learning for struggling students is enhanced
through educational opportunities that are meaningful (Westby, 2012). Systematically teaching literacy skills and motivating children’s interest in reading encourages later success with learning to read (Adams, 1990; Coleman & Bornholt, 2003; Lyon, 1998; Snow et al., 1998; Verhoeven & Snow, 2001).

There are a number of ways in which teachers can make instruction meaningful and motivate children to learn to read. Instructors can manipulate the presentation of literacy skills through engaging and playful interactions, active and personal participation, hands-on activities, and relevant contexts (Verhoeven & Snow, 2001). There is a large degree of overlap among these features of instruction but each is individually important for creating instruction that encourages student attainment of literacy skills, and is both meaningful and motivating. When students are motivated to participate in literacy activities, they are more engaged, involved in the task, and better able to develop literacy skills (Guthrie & Humenick, 2004). Providing instruction that is motivating, engaging, and focused on key literacy skills can help struggling readers achieve academic success.

**Playful interaction.** One way of motivating students to learn literacy skills is to provide instruction that is playful. Students are engaged in instruction when they are able to interact playfully with their instructor, peers, and surroundings. Instructors can provide an engaging environment through being animated and enthusiastic throughout a learning opportunity (Culatta, Aslet, Fife, & Setzer, 2004; Culatta, Kovarsky, Theodore, Franklin, & Timler, 2003; Culatta, Setzer, Wilson, & Aslett, 2004). Playful interactions can also involve instructor manipulation of voice, gestures, eye contact, and praise to increase children’s attention and participation as well as facilitate literacy learning (Levy, 2009; McGee & Richgels, 2004; Roth & Baden, 2001; Tancock, 1994). Playful interactions provide stimulating learning environments that increase
student motivation and capacity to learn and retain skills (Jimerson, Burns, & VanDerHeyden, 2007; Snow et al., 1998).

Instructors can also provide playful interactions through varying the presentation of instruction. Variety of presentation can be provided through lessons involving hands-on materials (discussed in a later section), unexpected or interesting events, physical activity, and child-centered discussion. Instructors may offer variety within a routine or break away from a predictable routine in order to engage children and hold their attention (Culatta, Aslett, et al., 2004; Culatta et al., 2003; Culatta, Setzer, et al., 2004). Promoting motivation and engagement in literacy learning depends on these playful interactions and other instructional strategies operating simultaneously (Verhoeven & Snow, 2001).

**Active and personal participation.** Teachers can also personally involve students in literacy-based interactions by building upon their knowledge and background. Activities that personally involve students activate their attention, increase engagement and motivation, transmit positive attitudes towards learning, and contribute to skill development (Guthrie & Humenick, 2004; Verhoeven & Snow, 2001; Westby, 2012). Understanding of instruction is increased when students are able to personally and culturally connect with the materials and presentation of the target skill or behavior (Adams, 1990).

Children are actively involved in learning when they are provided with opportunities to participate in the reciprocal sharing of personal and peer experiences and knowledge. When accessing their knowledge and cultural background to make contributions to activities, children increase their capacity to internalize skills and fully participate in the learning process (Verhoeven & Snow, 2001). In a shared learning environment, students are afforded multiple opportunities to learn a skill because they are able to make personal contributions and listen to
those from others. The increased personal participation and the scaffolding support of others enhances learning by creating interactive contexts (Westby, 2012).

Student interactions and contributions to the learning experience are further enhanced by cooperative and collaborative learning experiences. Collaborative and cooperative involvement with peers is important to academic and reading success and make learning experiences meaningful (Snow et al., 1998). Collaborative experiences involving instructors and students enable frequent discussion of the purposes and goals of reading and writing and allow students to make meaningful contributions to these literacy goals. The increased social interaction among students and instructors provided by cooperative learning experiences creates an environment that facilitates greater learning, retention, and personal involvement for each student (Baker et al., 2000).

Children may also contribute their own ideas to lessons when they are provided with opportunities to have control over their learning, allowing them to experiment with and experience learning first-hand. This can be achieved through open activities that offer children choices and control over their learning, as opposed to closed activities that constrain and limit children to controlling and rigid instruction (Baker et al., 2000). When children contribute to the planning of the activities and the monitoring of the activity outcomes, they are more receptive to the instructional material, more actively engaged, and have more opportunity for interaction and exposure to targets (Westby, 2012).

**Hands-on activities.** Student motivation and engagement is also encouraged through hands-on experiences that are interesting and exciting. Children’s capacity to learn is increased when hands-on and interactive experiences are incorporated with intense, systematic, and attractive instruction (Bingham et al., 2010; Verhoeven & Snow, 2001). Attractive hands-on
materials can be used to stimulate participation and enjoyment and allow students to make a product. In a SEEL activity titled “Make a Cap” students are shown how to use a scrap of paper to make a cap they can wear on their heads. They can even make two flaps, a strap, and some snaps out of the scrap that they can put on the cap. Children make their own hats out of scraps of paper and are able to wear them around the class. Hands-on experiences may also include activities with a built-in desirable spectacle or element. For example, in an activity highlighting the –op word ending, children could hop, stop, and pop as they hop on bubble wrap to pop it. These interesting and meaningful learning opportunities engage children and hold their attention (Culatta, Aslett, et al., 2004). Hands-on activities stimulate participation in the learning process because they encourage playful interactions that are not drill or rote (Roth & Baden, 2001).

Another way to provide hands-on instruction is to incorporate play-based activities. Educational opportunities that incorporate play are valuable to literacy learning (Westby, 2012). Play can contribute to educational development by providing a fun and appealing environment where children can learn (Zigler & Bishop-Joseph, 2009). Play-based activities that are interesting and interactive increase student engagement, provide frequent opportunities for students to learn and practice literacy skills, and encourage students to be involved in the learning process. Because children naturally use play as a vehicle for amusement and interaction, hands-on and playful literacy activities promote engaged learning experiences (Lyon, 1998; Snow et al., 1998; Verhoeven & Snow, 2001). When students participate in hands-on learning opportunities, they are more motivated and engaged during instruction and better able to learn and retain the information (Adams, 1990; Guthrie, Wigfield, & VonSecker, 2000; McGee & Richgels, 2004; Snow et al., 1998; Verhoeven & Snow, 2001).
Guthrie et al. (2000) provided a model for literacy intervention that focused on increasing student motivation and engagement through hands-on activities. They stressed the importance of hands-on experiences with tangible objects, materials, and people; collaborative learning; and interesting texts. The study looked at the effectiveness of their program in increasing students’ intrinsic motivation and found that through hands-on materials and experiences their curiosity for reading, academic engagement and interest, and active learning increased.

**Relevant contexts.** Effective early literacy instruction can also be influenced by the context in which material is presented to students and the topic or theme of the lesson/activity. A relevant context for literacy instruction is one that is authentic, meaningful, age-appropriate, and theme-based.

Contexts that relate to real life help students recognize the importance of reading and writing (Adams, 1990). Relevant contexts that are built into literacy learning incorporate real life experiences and events and show students the practical, purposeful, and enjoyable uses of reading and writing in everyday activities. Some ways that instructors can create relevant learning contexts is by bringing to life daily events such as writing or following recipes, reading or writing social notes, making grocery lists, or following instructions to build a toy (Roth & Baden, 2001). Activities that incorporate everyday experiences into literacy learning and create a familiar and comfortable environment encourage students to experience and experiment with reading and writing. Authentic reading and writing experiences should be relevant to a child’s everyday communicative environment and not the repetitive practice of isolated behaviors (Badger & MacDonald, 2010; Iversen & Tunmer, 1993; Verhoeven & Snow, 2001).
Use of Technology to Increase Frequency of Instruction

In addition to motivating and involving students, instructors need to provide supplemental instruction for struggling readers. Ensuring that instruction is engaging will permit the teacher to increase opportunities for children to practice skills (Verhoeven & Snow, 2001). One other way to increase opportunities to practice skills is to provide children with interactive learning activities via a technological device. This section addresses the benefit technology can have for instruction in general and for the teaching of early literacy skills in specific.

Value of technology for learning. The culture of education is changing rapidly with the introduction of various forms of technologies in the classroom. As teachers are faced with the challenge of providing adequate instruction to culturally and cognitively diverse students, technology is an additional resource that can be integrated into instruction to fulfill these needs. Used appropriately, technology can enhance and extend meaningful literacy practices to meet the needs of a variety of students (Larson, 2008; Marsh, 2009). Technology can be successfully used in the classroom as it is blended with face-to-face interactions. It plays an important role in early literacy as it provides additional support to instruction, teaches literacy skills, and increases student motivation and engagement.

Role of technology in early literacy instruction. For many students, especially those at-risk for reading difficulties, regular classroom instruction may not sufficiently teach important literacy skills (Pinnell, 1989; Snow et al., 1998). Technology can be employed within the classroom as a supplemental material to classroom instruction to help struggling readers. Digital materials provide scaffolding for diverse learners and are a source for differentiated instruction (Culatta, Culatta, Frost, & Buzzell, 2004). In bringing digital materials into the classroom for instructional purposes, teachers are encouraged to integrate technology with high-quality
interaction and instruction to provide students with first-hand experiences with learning and additional exposure to the classroom curriculum (Banister, 2010; Bestwick & Campbell, 2010; De Temple & Snow, 2001).

As teachers blend interaction and instruction with technology, they are better able to provide adequate instruction to a variety of students (Culatta, Culatta, et al., 2004). Connecting digital activities to classroom curriculums and objectives provides students with follow-up practice in target literacy patterns and skills. Digital texts can be tailored to match students’ needs, experiences, and knowledge, which creates a supportive learning environment. Digital materials accommodated to fit children’s reading levels or literacy goals enhances their understanding and attention to the task so that they are better able to attain the target literacy skill (Adams, 1990).

**Use of technology to teach literacy skills.** Technology can be used within the classroom to help develop literacy skills in emerging readers. Digital books (also referred to as e-books) have been used in a variety of ways to improve reading by teaching specific literacy skills and extending learning opportunities to provide struggling students with access to the entire education curriculum (Banister, 2010; Gonzalez, 2011). Electronic devices can be used to offer frequent and explicit encounters with particular patterns in literacy such as letter-sound associations (Culatta, Culatta, et al., 2004). By using technology to focus a child’s attention on specific literacy skills, students are effectively provided with increased opportunities for learning.

There have been a number of studies conducted that observed the effective use of digital e-books to teach a variety of fundamental reading skills (Segal-Drori et al., 2010; Shamir, 2009; Shamir & Korat, 2007). Shamir and Schlafer (2011) focused their observations on the
effectiveness of e-books in helping students attain phonological awareness and concepts about print. E-books were used to emphasize and highlight these features of literacy. Kindergarteners with varying literacy skills (typical and at-risk for learning disabilities) were randomly placed in a control group that received regular classroom instruction or in an experimental group that participated in six sessions of intervention using e-books. All students in the study increased their phonological and print awareness, but the experimental group, including students at-risk for learning disabilities, experienced significantly more improvement.

The value of technology in instruction is also evidenced by students’ improved literacy skills. Harris (2010) conducted a study that looked at the effect of technology on the reading scores for academically at-risk ninth graders. The study incorporated electronic educational technology into regular instruction in the curriculum for four months. Embedding technology into instruction had a significant impact on reading scores and most of the at-risk students improved in reading by at least one grade level. Digital books can successfully be used to teach literacy skills because of features that highlight these patterns and provide unique experiences and exposure to text (De Temple & Snow, 2001).

Additionally, shared book-reading experiences via digital books can be used to successfully teach literacy skills. Segal-Drori, Korat, Shamir, and Klein (2010) looked at the effects of combining adult instruction and reading with e-books on kindergarteners’ emergent literacy. Kindergarteners were separated into four groups that were assigned to a different type of interaction with books (joint or independent reading with e-books or books in print). The group of kindergarteners that read e-books with an adult achieved greater progress in literacy skills as compared to the other groups. Similarly, Larson (2010) focused his case study on the shared book-reading experiences of two second-grade girls who read books together on an
Amazon Kindle digital book reader. The e-books offered unique opportunities for the students to access different forms of text and interaction. Shared reading on the Kindle provided the students with hands-on opportunities to read, discuss, and manipulate text. Digital texts can encourage literacy development as students use unique ways to interact with each other, make connections with their peers, and extend learning beyond the text. Integrating technology with instruction and interaction can be an effective resource for improving early literacy skills and increasing motivation.

**Function of technology to increase motivation and engagement.** In addition to teaching skills and providing supplemental instruction for at-risk students, technology can promote engagement and improve reading attitudes and motivation (Levy, 2009). Technology can be used as a unique resource to invite more playful and interesting reading experiences. Technology engages readers by providing a combination of audio and visual effects that are hands-on, playful, interactive, and stimulating (Verhoeven & Snow, 2001).

Increasing student engagement and interaction in the learning process is important for at-risk students who are not responding to traditional classroom instruction (McGee & Richgels, 2004; Verhoeven & Snow, 2001). Technology promotes engagement because students can actively participate in learning through the use of creative and personalized texts. Reading and writing about personal experiences activates prior knowledge and personal meaning construction (Baker et al., 2000; De Temple & Snow, 2001). Digital materials allow the selection and creation of engaging texts that are immediately relevant to students.

Digital texts that are customizable activate engagement and interest in young readers. Shiratuddin and Landoni (2003) looked at student engagement during an activity involving the creation of personalized digital books. Students made their own storybooks on a digital program.
called Story Builder. Students showed excitement and enthusiasm during the creation of their own storybooks and were highly interested and on-task during the entire activity. Children gained hands-on experience with text using the technology as a nontraditional learning modality. Language and literacy skills that are presented through enjoyable activities can be enhanced through technology because text becomes relevant as children are able to interact with it in a variety of ways (Marsh, 2009; Zucker et al., 2009).

**Purpose of Study**

The purpose of this study is to take an existing literacy program (Systematic and Engaging Early Literacy) that provides explicit instruction within motivating hands-on activities and supplement the instruction by providing opportunities to practice reading and writing via iPad digital books. In this way the instruction capitalizes on the benefits of blending technology with face-to-face instructional interactions to provide struggling students with the additional exposure and practice they need with target literacy skills. The study was designed to answer the following question: What are the effects of blending SEEL instruction and iPad digital books on teaching students who are at-risk for reading difficulties to read consonant-vowel-consonant (CVC) words?

**Method**

**Participants**

The participants for the study were four kindergarteners, including two Caucasian males (Tavigk, age 5 and Jared, age 5), one Hispanic male (Steven, age 5), and one Caucasian female (Alyssa, age 5). Pseudonyms are being used to refer to the children and maintain their confidentiality. Alyssa, Tavigk, and Jared spoke English as their primary language. Steven
entered kindergarten speaking very little English. His family moved to the United States shortly before Steven was born and Spanish was the dominant language spoken in his home.

The children attended the same elementary school in the Mountain West region of the United States. At the time of the study the school served 561 students from kindergarten to sixth grade. In terms of demographics, 36% of students qualified for free or reduced lunch, 86% of students were Caucasian, 10% of students were Hispanic, and the remaining 4% of students were Asian, African-American, or Pacific Islander. There were two kindergarten teachers at the school who taught a total of three classes. One of the classes was full-day and the other two were half-day. Two of the students involved in the study were in the half-day class and two of the students attended an optional extended day program.

The four children were invited to participate based on performance on classroom assessment measures and teacher recommendation. Throughout the school year, student progress was monitored closely by routine assessments conducted by teachers and classroom assistants. The assessments included the Dynamic Indicators of Basic Early Literacy Skills (DIBELS), a Phonemic Awareness Survey created by the local school district, and a Formative 10-week assessment designed by the local district literacy specialist. The skills assessed phonological awareness and phonics skills including letter-sound associations, segmenting words into phonemes, and decoding nonsense words. Student performance on these measures was used to identify students who were at-risk for reading failure and in need of intensive supplementary instruction. Interviews were conducted with the teachers to further identify participants for the study.

Because one of the students, Steven, was an English-Language Learner (ELL), further consideration was required in identifying his need for intervention, and subsequently, to address
his added learning challenges. Steven presented with low literacy and language abilities in both his first language and in English. He was not responding to core classroom instruction and demonstrated a need for highly intensive and extensive literacy intervention. In previous studies (Culatta, Reese, & Setzer, 2006; Culatta, Culatta, Frost, & Buzzell, 2004), SEEL proved to be a successful program to meet the additional challenges and needs of ELL children and was deemed an acceptable research-based intervention for this student. SEEL’s hands-on, engaging, and contextually relevant activities is one approach to providing ELL students with meaningful opportunities to learn.

Students involved in the study were identified as Tier 3 and at-risk for reading difficulties because of their failure to reach adequate literacy levels and respond to Tier 1 and Tier 2 instruction. The students participating in this study scored poorly and below expected norms on the standard classroom assessments described above. The assessment process used in the kindergarten classrooms was in accordance with a Response to Intervention (RTI) approach (Jimerson et al., 2007). RTI is a multilevel prevention system used to identify students with learning or reading disabilities. All students receive quality general classroom instruction in Tier 1. Students who do not make adequate progress or whose skill level is significantly below peers in Tier 1 receive intensive intervention in small groups in Tier 2. Students who continue to function below their peers with the additional instruction in Tier 2 participate in frequent one-on-one and small group individualized instruction in Tier 3. Students in Tier 3 receive weekly progress monitoring and classroom-based informal assessments (Davis, Lindo, & Compton, 2007; Jimerson et al., 2007).
Once students were selected, consent was obtained from the students’ teachers and parents. A letter outlining the purpose and procedures of the study was signed by the parents of each participant (Appendix A).

Before beginning the intervention, the researcher separated the four children into two dyads according to performance on the classroom assessment measures, which grouped students of similar performance measures together.

**Design**

A single-subject, multiple-baseline-across-skills design was used to examine the effects of the combined hands-on and digital instruction on at-risk students’ ability to read CVC words. This design was similar to that of Marshall (2011) and was selected to measure the students’ performance on trained and untrained target phonetic patterns.

**Selection of targets.** The targets chosen for intervention were –ot, –og, and –ap. The targets was selected based on the teacher’s order of instruction of vowel-consonant target, which followed the SEEL curriculum found on the website. During the study and throughout the school year, the participants were involved in regular classroom instruction which included daily SEEL activities that were completed during center time. In center time, students were separated into groups that rotated through various stations to participate in literacy activities. One of these was a SEEL station in which parent volunteers conducted SEEL lessons. The SEEL activities introduced during center time followed the SEEL curriculum, and a new SEEL target was introduced every week throughout the year.

Baseline assessment began during the week that the short “o” vowel was first introduced to the class in regular classroom instruction of the vowel-consonant ending –ot. The –og target was chosen as the subsequent target based on the teacher’s order of instruction of vowel-
consonant target endings, which was aligned with the SEEL curriculum. The –ap target was one that the students had previously been introduced to earlier in the school year. It was selected as the final target because the students were significantly behind their peers and classroom expectations due to their failure to attain it despite receiving prior instruction highlighting the target.

Sequence of intervention. The students were taught one target pattern at a time, while the other patterns remained untreated, starting with –ot and then following with –og and –ap. Students received intervention for approximately six weeks, in three treatment sessions per week, with six instructional sessions for each target pattern. Once students participated in all six lessons for the target, it was assessed for maintenance; intervention began on the second target, while the other untreated target was measured for baseline. Prior to initiation of any instruction, all targets (–ot, –og, –ap) were assessed in an untreated baseline condition.

Intervention began with the –ot target while –og and –ap remained untreated and measured in baseline. After intervention was completed with –ot, instruction began on the –og target, with –ot measured for maintenance and –ap remaining untreated in baseline. Finally, students received intervention with the –ap target, after which all of the targets were assessed a final time. Reading ability was deemed adequate if students were able to read five out of six words for each target ending (-ot, -og, -ap). At the conclusion of the intervention, students’ reading abilities were assessed by comparing baseline performance to performance at the end of instruction on all three target phonic patterns.

Procedures

This section details the procedures involved in assessment and implementation of the intervention.
**Assessment.** The assessment portion of the intervention included baseline assessment and continued performance monitoring throughout the course of the intervention. The assessment procedures are detailed below.

**Baseline.** Prior to the initiation of intervention, baseline assessment was conducted to record students’ entering performance in reading 18 target words. Students showed no improvement in their ability to read the target words throughout the baseline sessions.

**Performance monitoring and maintenance.** Continued assessment took place immediately after each intervention session. Each student was asked to read the 18 target words, as described in the reading of phonics patterns section above.

Students were assessed in the same order each day to keep conditions the same throughout the experiment. While one student completed the assessment task, the other student waited in a separate room and completed a drawing or writing assignment relating to the intervention activity. It was explained to students that they would receive a small prize after trying their best to read some words on the computer and that they would be given this prize no matter how many words they read correctly. The students received the prize immediately after completing the assessment and returned to their classroom.

Assessments were video or audio recorded, and the results were recorded on an assessment sheet and an Excel spreadsheet shortly after the assessment had taken place. The researchers viewed 30% of assessment sessions to ensure reliability in assessment practices and agreement in results. The researcher and research assistant had an identical assessment sheets containing each of the target words (Appendix C). The number of times the researcher and research assistant agreed that the student read a word correctly or incorrectly was counted to determine the number of agreements. Similarly, the number of times the researcher and assessor
disagreed that the student read a word correctly or incorrectly was counted to determine the number of disagreements. Inter-judge reliability was calculated by dividing the total number of agreements by the total number of words and multiplying by 100. Inter-judge reliability for this assessment was calculated to be 98%.

**Implementation of the intervention.** The instruction consisted of blending hands-on experiential activities with opportunities to practice reading and writing via customized iPad digital books. The hands-on portion exposed children to frequent and salient models of target CVC words the children were learning while the iPad turned the experience into a digital book where children participated in reading and writing about the activity. Thus the instruction was presented in two phases: hands-on experience with targets and personalized iPad digital books that provided opportunities to read and write.

**Hands-on activities.** The hands-on activity portion of the instruction utilized SEEL activities found on the SEEL website. SEEL is an early literacy approach designed to provide young children with opportunities to develop a strong grasp on early literacy skills (Bingham et al., 2010; Culatta, Aslett, et al., 2004; Culatta, et al., 2003; Culatta, et al., 2006; Culatta, Setzer, et al., 2004; Culatta, Culatta, et al., 2004; Korth, Sharp, & Culatta, 2010). SEEL is a comprehensive literacy program for emerging and struggling readers that is intensive, systematic, explicit, and playful. SEEL’s hands-on and interactive activities promote motivation and engagement by embedding instruction in meaningful contexts that target specific skills through adult-directed activities that are playful, child-centered, and engaging. SEEL lessons can be easily adapted to fit the needs of individual students while providing them with additional opportunities to learn the classroom curriculum.
**Digital books.** The digital books used for instruction during intervention were created and presented on an iPad second generation through an application called Pictello. Pictello was downloaded from the iTunes store and the researcher created personalized digital books by taking pictures with the iPad, downloading digital pictures onto the iPad, and inserting text highlighting the targeted phonetic patterns. Although there are other story-making applications available for download on the iPad, Pictello was chosen because of its clear instructions, simple design, and easy editing options.

The researcher created two books that corresponded to each SEEL lesson. One book was created to allow students to personalize the book by typing a target word in the text. This book remained unfinished and in editing mode, which allowed students to type in a desired target word and make a personal contribution to the text. The second book was complete and was presented in story mode so children could participate in a reading activity with the target words.

The computerized books were formatted with a recorded human voice, personalized pictures and text, and elements of interactivity. The digital books provided purpose and meaning to the reading experience because the pictures and text depicted events that the children were personally involved in. The Pictello books were written to highlight the target phonetic pattern and were illustrated with children participating in the hands-on instructional experience of the SEEL activity, with at least one picture of the students involved in the intervention. The remaining pictures in the book were pictures of peers participating in the same activity they experienced.

**Setting.** Intervention was conducted in a room located just outside the classroom. Each intervention session lasted approximately 25 minutes and students received intervention three days a week. The instruction was provided by a graduate and an undergraduate student, both
SEEL employees experienced in teaching and writing SEEL lessons. Each dyad received instruction two days out of the week (Monday and Friday) by one instructor and received instruction from a separate instructor one day out of the week (Wednesday). If a student was absent during one of the scheduled instruction days, one of the instructors came another day during the week (Tuesday or Thursday) to teach the student the SEEL lesson they missed.

**Components of a session.** This section describes the components of each intervention session, which followed a particular order. In each intervention session, students participated in a SEEL activity that highlighted targeted phonics patterns (vowel-consonant endings of –ot, –og, and –ap). Students were provided with opportunities to identify the goal, encounter salient examples of the target pattern in hands-on activities, and practice reading and writing target words via the iPad digital book.

The activity plan titled *Find a Spot in the Parking Lot* will be used to describe a typical intervention session. The following is the structure of an intervention session provided to the students by the researchers.

**Pre-teach and model.** The instructor began each session by pre-teaching the target pattern through introduction and modeling. Explicitly introducing and modeling the target was important because children learn more easily and retain more information if they understand what they are going to learn, why it is important, and how it will be taught (Culatta, Kovarsky, Theodore, Franklin, & Timler, 2003; Culatta, Reese, & Setzer, 2006; Culatta, Setzer, Wilson, & Aslett, 2004).

At the beginning of the *Find the Spot in the Parking Lot* lesson, the instructor explicitly introduced the purpose of the activity by explaining to the students that they were going to learn about the word ending –ot and that they would need to listen for and use this target during the
activity. They were told to listen to the words in the title and hear that spot and lot rhyme. The students were instructed to look and listen for words that rhyme with lot during the activity. The instructor also explicitly isolated, pointed to and identified each letter name and sound for letters “o” and “t”, then explained that these letters together make the “ot” ending in words. In this way, students were instructed to attend to the rime ending “ot” in the target words.

*Identify and blend CVC words in hands-on activity.* After the introduction of the target and the goal of the activity, the instructor provided students with intense exposure to the target through a SEEL activity. Each SEEL activity highlighted a target sound pattern and provided students hands-on experience and frequent verbal exposure to the target through active participation, play, and conversation. The instructor modeled the target several times and encouraged students to hear, use meaningfully, and manipulate the target throughout the activity. Students developed phonological awareness skills by identifying the rime ending of the target and using various onsets to work on the task of blending the words into onset + rime.

In the parking lot activity, each student had a car on the parking lot game board. To determine the number of spaces the student could move their car in the lot, they picked up one of four dots (numbered 1-4). Each spot in the parking lot had a word written in it and students collected a dot each time the word in the spot they landed in rhymed with the word lot. The instructor helped the students listen to and identify words that rhymed with lot and use word-play with –ot to create their own words. The activity provided students with multiple exposures and opportunities to use the target sound.

*Read and write about the experience via the iPad.* After providing examples of the target words in a hands-on activity, the instructor presented students with reasons to read and write about the experience via digital books on the iPad. In this follow-up activity, the digital books
created on the iPad were used to heighten students’ awareness and increase their practice with the target phonic pattern. The purpose of this exposure was to help students develop phonics skills in which they attached the regular phonological pattern to printed letters. The digital books enabled the students to identify the initial onset consonant and the rhyme ending pattern in their orthographic forms, thus solidifying the letter-sound correspondences within the target words.

The digital book was based on the child’s first-hand experience and provided frequent opportunities for the student to read the target words as they read about the activity. The students shared an iPad and took turns using the iPad functions to listen to a digital voice read about the activity they completed. The instructor highlighted each target word by pointing to them and sounding them out with the students.

In addition to reading the digital book, the instructor provided students with opportunities to type the target words into the book as a third exposure to the target pattern. The instructor worked with the students to help them sound out the target words and locate the letters on the keyboard.

The instructor allowed the students to read the book, use the recorded human voice reader, and type in the target words. The digital books were used to increase meaning and interest and reinforce skills through additional exposure and practice producing and reading the target patterns. Use of digital books allowed students to practice reading and writing in contexts that were meaningful, engaging, and related to their own experiences.

**Measures**

Measures in this study consisted of performance during reading tasks and observations of children’s engagement during the instructional activities. The reading task was devised to determine children’s ability to read the phonic patterns targeted in this study, which included 18
target CVC words. In addition, a measure was selected to obtain information about children’s engagement during instruction.

**Reading of phonic patterns.** The assessment tasks were created for each of the target words that would be taught during the study. There were 18 words children would be asked to read, six examples of each of three target phonic patterns: –ot, –og, –ap (see table 1). The assessments were created on a PowerPoint, which displayed each word individually on the computer screen. Students were instructed to try their best to read each word and that “I don’t know” was an acceptable answer. Students were shown how to press a button to move on to the next word. Each of the 18 target words was presented during each baseline trial and each subsequent assessment task.

Table 1

*Target Words Taught to Students*

<table>
<thead>
<tr>
<th>-ot words</th>
<th>-og words</th>
<th>-ap words</th>
</tr>
</thead>
<tbody>
<tr>
<td>dot</td>
<td>dog</td>
<td>map</td>
</tr>
<tr>
<td>pot</td>
<td>hog</td>
<td>cap</td>
</tr>
<tr>
<td>hot</td>
<td>log</td>
<td>tap</td>
</tr>
<tr>
<td>not</td>
<td>bog</td>
<td>rap</td>
</tr>
<tr>
<td>rot</td>
<td>fog</td>
<td>lap</td>
</tr>
<tr>
<td>got</td>
<td>jog</td>
<td>gap</td>
</tr>
</tbody>
</table>

To ensure the randomized presentation of the words, 10 PowerPoint documents (labeled 1–10) were created. To determine the order of the words for each PowerPoint, target words were selected randomly from a box and entered into the PowerPoint document.

**Engagement.** Information about student’s engagement in the activities was obtained through direct observation and analysis of videotapes. The researchers served as participants and
observers, noting children’s actions and expressions of emotion to the SEEL instruction and the iPad. The researchers compared and contrasted participation across different types of literacy activities.

Direct Behavior Ratings (DBR) were collected as quantitative measurements of student behaviors throughout an entire intervention session. Videotaped samples of the students participating in the digital books were reviewed and analyzed for interactions and participation. Two judges were used to rate the level of student engagement during the SEEL activities. These judges were not informed of the purpose of the study or its procedures, but were asked to watch videos of the intervention and rate student engagement. Engagement was recorded using the Direct Behavior Rating (DBR) scale developed by Chafouleas, Riley-Tillman, and Christ (2009). DBR was used to assess a core set of behaviors which include academically engaged, respectful, and disruptive.

According to the scale, students were academically engaged when actively or passively participating in the academic activity (i.e. writing, asking a question, talking about the lesson, listening to the teacher, looking at instruction materials). For example, a student might look at the teacher and materials, repeat a target word, or contribute a related comment to the lesson. Respectful behavior was evidenced when a student displayed compliant and polite behavior in response to adult direction and/or interactions with peers (i.e. follows teacher direction, pro-social interaction with peer, positive response to adult request, verbal or physical disruption without a negative tone or connotation). A student demonstrated respectful behavior by taking turns in a game or during the digital book reading with their peer or by using the materials appropriately. Disruptive behavior involved student action that interrupted regular group activity (i.e. out of seat, fidgeting, playing with objects, acting aggressively, talking/yelling about things
unrelated to instruction). Disruptive behaviors included sitting on the table, running around the room, grabbing lesson materials from the instructor or their peer, or arguing with the instructor or peer.

Judges were given a rating scale on a line numbered 0% to 100% in ten percent intervals and were asked to mark a place on the line that best represented the percentage of the total time that the student exhibited each target behavior (see Appendix F). For example, each judge watched the entire 25 minutes of an intervention session and rated each student individually according to each of the three behaviors. Six videos for each dyad were randomly selected. The remaining videos were used for training purposes and to establish inter-rater reliability of the judgments on the DBR before the ratings were made. Inter-rater reliability for this measure was 96% and was established following the viewing of the DBR tutorial (found online at http://www.directbehaviorratings.com/cms/index.php/library/online) and three training sessions held with the primary researcher.

Data Analysis

To analyze the data, each students’ performance during baseline, treatment, and maintenance conditions were plotted on individual graphs displaying baseline assessment and intervention assessment information. Graphs consisted of a y-axis, displaying the number of words read correctly, and an x-axis, displaying the chronological number of the intervention sessions. The graphs were analyzed visually to determine the effectiveness of the intensive six-week intervention in teaching at-risk kindergarteners to read the targeted phonic patterns. Components of the graphs that were analyzed included patterns of acquisition, levels of word attainment, or increase and decrease of data points, and overlapping data points between
baseline, intervention, and maintenance. Mean scores, standard deviation, and range for each condition of each target were calculated for each student.

**Treatment Fidelity**

To determine that the instruction that was implemented followed faithfully the procedures and principles outlined, which included the explicit modeling of the target, intense exposure to target, playful and engaging interaction, and reciprocal interactions, sessions were observed for treatment fidelity. Treatment fidelity was measured using a SEEL treatment scale developed by Marshall (2011). Intervention sessions were video recorded and 30% of them were analyzed to determine the level at which SEEL principles were present in intervention sessions. Two research assistants who were familiar with SEEL, having had experience in both teaching and writing SEEL activities, were trained together to analyze the lessons. The researcher created a treatment fidelity check sheet (see Appendix E), which contained questions focusing on each of the five principles of SEEL.

The first two SEEL principles of *meaningfulness* and *explicitness* were recorded by answering several yes or no questions. These questions included, “Was the activity appropriate for kindergarten children?” and, “Did the instructor explicitly state the target at the beginning of the lesson?”

The principle of *playful and engaging* was rated using a four-point scale (none of the time, some of the time, most of the time, or all of the time) to indicate the level at which instructor playfulness, student enjoyment, and student involvement was evident. It was acceptable for the ratings to include “most of the time” (approximately 75-90%) or “all of the time” (90-100%). Instructor playfulness was evident through tone of voice, facial expressions, making playful statements, joining in a fun activity, and laughing and playing with the students.
Examples of student engagement included facial expressions, verbal exclamations, and on-task behaviors. The research assistants were also asked to take notes on the aspects of the intervention which were least or most engaging to help researchers in the comparison of student engagement during the SEEL lesson versus the iPad instruction.

*Intense exposure to targets* involves the number of times the instructor models and uses the target words and sounds during the activity and whether students were given adequate opportunities to experiment with the targets themselves. Intense exposure to targets was demonstrated if the instructor used the target an average of 10 times per minute throughout the lesson. During a 20-minute lesson, this would mean that the students were exposed to the target at least 200 times.

The final SEEL principle, *reciprocal exchanges*, was determined by using the four-point scale (none of the time, some of the time, most of the time, or all of the time) to rate to what extent the instructor created opportunities for the students to respond, make comments, and contribute to the interaction. Due to the variable structures of the activities, “some of the time” (25-75%) was also an adequate rating for this measure. The research assistants also recorded how often this was observed throughout the lesson. The number of reciprocal exchanges often varied depending on the activity but a minimum of seven reciprocal exchanges was determined to be adequate for this principle.

Inter-rater reliability was established through training sessions with both research assistants present. During this training, the researcher discussed the SEEL principles and the items corresponding to each principle found on the form. The research assistants watched several practice videos and provided individual ratings for each SEEL principle discussed above. The ratings from each observer were then compared for reliability. Because there were five
SEEL principles discussed, each principle was 20% of the total rating. The ratings for each principle were compared and certain fractions of the 20% were taken away according to observer differences. Following two practice videos in which reliability remained at 87 and 88%, reliability was established at 91% on a third video after aspects of the previous ratings were reviewed.

Each observer watched the remaining six videos independently to analyze the SEEL lessons for treatment fidelity. The principle of meaningful and explicit was met by all six videos analyzed. Student engagement and instructor playfulness was rated appropriately in each video as “most of the time” or “all of the time” by both observers. It was noted by the observers that student engagement was inconsistent for the iPad portion of the study. The research assistants recorded that occasionally the students got distracted or bored during the reading of the iPad books, but remained involved and eager participants during the entire SEEL lesson portion of the intervention. Further discussion of student engagement during the SEEL activities and iPad practice can be found in the discussion section. The principle of intense exposure to targets was met by all of the lessons as the students were exposed to the targets an average of 10 times per minute throughout each lesson. The final principle of reciprocal exchanges was adequate for all six lessons as the instructors provided students the opportunity to participate in the lesson and were responsive to the students’ actions and comments. The observers rated the use of reciprocal exchanges as occurring “most of the time” and “all of the time”. The number of reciprocal exchanges varied lesson to lesson but ranged from 8 to 15 exchanges, exceeding the minimum requirement for appropriate number of exchanges.
Results

This section contains data for each student participant. The data is presented visually in a graph and is accompanied with a description of student performance during each phase of the intervention, the accuracy and speed of attainment of the targets, the trend of the data points, and overlapping data points. Also included is the statistical analysis of the data including the mean, standard deviation, and range for each phase of the intervention.

Individual Student Performance on Word Reading

Each student participated in a total of 18 intervention session; six intervention sessions were conducted for each target. The first three to four sessions were baseline sessions measuring student ability to read the target words prior to structured intervention. Student reading abilities were monitored through assessments following each intervention session; those students who were able to read a minimum of five out of six words per target were determined to have met the criterion, suggesting that they attained the ability to read the target. The following sections contain data for each individual student.

Alyssa. Initially Alyssa was unable to read the target words in the baseline condition for all three targets. This remained constant for the –ot and –ap targets, but there was an unexpected increase during the last three sessions of the baseline phase for the –og target. Alyssa was able to achieve the criterion level of reading five out of the six target words for each target following the intervention and maintenance phases. Alyssa continued to improve in her ability to read the targets in the maintenance phase with increased scores and greater consistency, despite the fact that the target was no longer the focus of instruction. Her mean score across all targets for the baseline condition was 0.98. This rose to 4.67 during the intervention phase and 5.33 during the maintenance phase. Alyssa’s results for each target during each phase are described below and
Figure 1:

Alyssa’s results for –ot, –og and –ap targets
presented in Figure 1. Mean scores, standard deviation, and range for all targets and conditions are found in Table 3.

**–ot target.** In the baseline condition Alyssa read one –ot word in three of the baseline sessions. During the intervention phase her ability to read –ot words increased to a mean of 4.00 with a range of two to six words read. Alyssa reached the criterion level marking attainment of the target as she read five of the six target words during the intervention phase. In the last session of –ot intervention, Alyssa dropped from six words read to four words. In the subsequent five sessions of the maintenance phase Alyssa continued to read three to four –ot words, after which her performance increased and she was able to read a minimum of five words in the last seven sessions. In two of the maintenance sessions she was able to read all six –ot words. Her mean words read from the intervention to maintenance phases increased from 4.00 to 4.66.

**–og target.** For the first seven sessions of the baseline phase for the –og target, Alyssa read zero to one words. Alyssa’s performance increased in the last three sessions of baseline as she was able to read five –og words and reach the criterion level without direct intervention. There were three overlapping data points in the baseline to intervention conditions. Despite this increase, the mean number of –og words Alyssa read during the baseline condition was only 1.30. During the intervention phase Alyssa consistently read five to six –og words with a mean of 5.17 words read. Alyssa continued to improve her performance during the maintenance phase as she was able to read all six –og words in each session.

**–ap target.** Alyssa’s baseline data shows she inconsistently read zero to two –ap words with a mean of 0.88 words read throughout the baseline condition. In the three sessions prior to the intervention phase, Alyssa read none of the –ap words. During the intervention phase, Alyssa made rapid improvement in her ability to read –ap words, increasing from zero to three
words after only one intervention session. Alyssa increased her reading from three to six words during the intervention phase. Alyssa reached criterion level for the target by reading five to six of the target words consistently across four sessions. There was no maintenance phase for the \( -ap \) target as it was the last target taught.

Table 3

*Alyssa’s Mean, Standard Deviation, and Range for all Targets, During Each Phase*

<table>
<thead>
<tr>
<th>Target</th>
<th>Phase</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>0t</td>
<td>Baseline</td>
<td>0.75</td>
<td>0.50</td>
<td>0-1</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>4.00</td>
<td>1.41</td>
<td>2-6</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>4.66</td>
<td>0.89</td>
<td>3-6</td>
</tr>
<tr>
<td>0g</td>
<td>Baseline</td>
<td>1.30</td>
<td>1.83</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>5.17</td>
<td>0.41</td>
<td>5-6</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>6.00</td>
<td>0.00</td>
<td>6-6</td>
</tr>
<tr>
<td>0p</td>
<td>Baseline</td>
<td>0.88</td>
<td>0.81</td>
<td>0-2</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>4.83</td>
<td>1.17</td>
<td>3-6</td>
</tr>
</tbody>
</table>

*Note.* There was no maintenance phase for the \(-ap\) target as this was the last target taught.

Alyssa’s results for the \(-og\) target indicate that she was either able to generalize her learning from the \(-ot\) target to the \(-og\) target or there was some external factors influencing her ability to read these words without direct intensive intervention. Because of the similarity between the two targets which both contained the short “o” sound, it is likely that she generalized her learning of the \(-ot\) target to the \(-og\) target. Alyssa experienced generalization across targets only for the \(-og\) target; she required instruction provided in the intervention phase to help her achieve the criterion level for the \(-ap\) target.

Alyssa reached the criterion level for each target multiple times during the study; she reached \(-ot\) nine times, \(-og\) 13 times, and \(-ap\) four times. Her overall range in scores for each
target was zero to six and the trend of her data was an increase in performance from baseline to intervention to maintenance conditions. She was able to maintain her performance during the transition from intervention to maintenance phase for the –ot and –og targets and although there was no maintenance for the –ap target, her solid performance indicates that she would likely maintain the target as well. The mean scores for the intervention and maintenance phases were substantially larger than the scores during baseline, suggesting that Alyssa benefitted from participation in the study.

**Tavigk.** Throughout each phase of the intervention, Tavigk demonstrated generally variable performance. His data shows that during the intervention phase he was able to make improvements in his ability to read each target; he was able to reach criterion level for each target, though his progress fluctuated at times. His mean score during the baseline conditions across all targets of 1.09 increased only minimally to 2.08 for the intervention phases. Tavigk continued to improve his reading ability and consistency during the maintenance phases as his mean score across all targets increased to 5.09 words read. Tavigk was able to reach the criterion level of reading five out of the six target words for all of the targets during the intervention and maintenance phases. Tavigk’s results for each target during each phase are described below and presented in Figure 2. Mean scores, standard deviation, and range for all targets and conditions are found in Table 4.

**–ot target.** Baseline data showed that Tavigk was able to read two –ot words in two of the baseline sessions. Tavigk improved slowly during the intervention phase as he achieved a mean of 3.00 words and was able to read four out of the six –ot words at the end of this phase. Tavigk maintained his ability to read at least four –ot words during the maintenance phase. He demonstrated fluctuating improvement with scores ranging from three to six words read; he was
Figure 2:

Tavigk’s results for –ot, –og and –ap target
able to read six words across two sessions at the conclusion of the study. His mean during the maintenance phase was 5.09 words read. Despite his inconsistency, Tavigk was able to reach the criterion level.

–og target. Tavigk was unable to read the –og target during baseline with consistent zero scores across seven sessions. During the intervention phase Tavigk’s progress was limited and variable, with a mean of 1.50 words read and scores ranging from zero to four words read. His performance was largely impacted by his motivation to participate and his difficulty recognizing the pronunciation of “g” as it is a silent letter in his name. Tavigk continued to improve during the maintenance phase. He reached criterion level during this phase by reading five to six target words across five sessions with a mean of 5.50 words read during the maintenance phase.

–ap target. Tavigk’s ability to read the –ap target was unpredictable during the baseline phase, with performance ranging from one to four words read. During the intervention phase, Tavigk made improvement in a steady upward trend with a mean of 4.50 words read. His range of scores for the intervention phase was three to six words read. Tavigk was able to read five to six words consistently for three sessions, which demonstrated his attainment of the –ap target during the intervention phase. The intervention phase helped Tavigk increase his reliable reading of the –ap target. There was no maintenance phase for this target as it was the last target taught.

Despite Tavigk’s inconsistent performance during each phase of the study, the intervention phase for each target was critical to his attaining the ability to read the words. For the –ot and –ap targets there is a noticeable upward trend from the baseline to intervention phases, with continued increase in performance during the maintenance phase for the –ot target. For each target and in each subsequent phase there was an increase in the mean words read.
Tavigk was able to meet the criterion for the \(-ot\) and \(-og\) targets five times and the \(-ap\) target three times.

Table 4

*Tavigk’s Mean, Standard Deviation, and Range for all Targets, During Each Phase*

<table>
<thead>
<tr>
<th>Target</th>
<th>Phase</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>1.33</td>
<td>1.15</td>
<td>0-2</td>
</tr>
<tr>
<td>(-ot)</td>
<td>Intervention</td>
<td>3.00</td>
<td>0.89</td>
<td>2-4</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>4.67</td>
<td>1.07</td>
<td>3-6</td>
</tr>
<tr>
<td></td>
<td>Baseline</td>
<td>0.22</td>
<td>0.44</td>
<td>0-1</td>
</tr>
<tr>
<td>(-og)</td>
<td>Intervention</td>
<td>1.50</td>
<td>1.38</td>
<td>0-4</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>5.50</td>
<td>0.83</td>
<td>4-6</td>
</tr>
<tr>
<td></td>
<td>Baseline</td>
<td>1.73</td>
<td>0.96</td>
<td>0-4</td>
</tr>
<tr>
<td>(-ap)</td>
<td>Intervention</td>
<td>4.50</td>
<td>1.05</td>
<td>3-6</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* There was no maintenance phase for the \(-ap\) target as this was the last target taught.

Tavigk demonstrated difficulty during the intervention phase of the \(-og\) target. This was particularly evident in the last intervention session in which he read zero words. This session did not accurately reflect his ability to attain the target; a number of external factors such as motivation, attention, and difficulty with the “g” sound may have influenced his performance. These factors are detailed in the discussion section below. Prior to that intervention session Tavigk read four \(-og\) words and his data was approaching an upward trend. In the following session during the maintenance phase Tavigk read four \(-og\) words again, followed by five words the next day; this suggests that the intervention phase indeed influenced Tavigk’s ability to read the \(-og\) target.

**Steven.** After being unable to read any of the targets at the beginning of the intervention, Steven significantly increased his ability to read as a result of the intervention phases. Steven
Figure 3:

Steven’s results for –ot, –og and –ap targets
was able to reach the criterion level of reading at least five of the six target words during the intervention phases for each of the targets. His mean score during the baseline condition for all three targets was 0.75. This score increased to a mean of 4.39 during the intervention phases and continued to increase to a mean of 5.83 for all of the targets during the maintenance phase. Steven’s results for each target during each phase are described below and presented in Figure 3. Mean scores, standard deviation, and range for all targets and conditions are found in Table 5.

---ot target. Baseline data shows that Steven was unable to read the –ot target during the baseline condition. During the intervention phase, Steven’s performance increased in a constant upward trend as he was able to increase from zero words read to six words read. His mean score for the intervention phase was 2.33 words read. Steven was able to sustain his progress during the maintenance phase by reading five to six words consistently and reaching a mean of 5.83 words read.

---og target. During baseline, Steven was able to read only one of the six target –og words over three sessions, scoring a mean of 0.33 words read. Steven made more rapid improvements for the –og target as compared to the –ot target during the intervention phase. He ranged from three to six words read with a mean of 5.17 during the intervention condition. Steven reached the criterion during this phase as he was able to read five to six words consistently. He increased his mean score to 5.83 words read and was reading all six –og words reliably at the conclusion of the maintenance phase.

---ap target. During the first ten sessions of baseline, Steven demonstrated consistent inability to read the –ap target words. In the remaining five sessions of the baseline phase, Steven increased his ability to read the –ap target by reading five to six words without receiving intervention; there are five overlapping data points in the baseline and intervention conditions.
In the intervention phase, Steven continued to demonstrate his ability to read the –ap target with a mean score of 5.67 words read. There is no maintenance phase for this target because it was the last target taught.

Table 5

Steven’s Mean, Standard Deviation, and Range for all Targets, During Each Phase

<table>
<thead>
<tr>
<th>Target</th>
<th>Phase</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ot</td>
<td>Baseline</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>2.33</td>
<td>2.25</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>5.83</td>
<td>0.40</td>
<td>5-6</td>
</tr>
<tr>
<td>og</td>
<td>Baseline</td>
<td>0.33</td>
<td>0.50</td>
<td>0-1</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>5.17</td>
<td>1.17</td>
<td>3-6</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>5.83</td>
<td>0.41</td>
<td>5-6</td>
</tr>
<tr>
<td>ap</td>
<td>Baseline</td>
<td>1.93</td>
<td>2.71</td>
<td>0-6</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>5.67</td>
<td>0.51</td>
<td>5-6</td>
</tr>
</tbody>
</table>

Note. There was no maintenance phase for the -ap target as this was the last target taught.

Steven’s data shows an overlap of data points for the –ap target. Several explanations for Steven’s increased ability to read the –ap target during the baseline phase are presented in the discussion section below. Steven was able to reach the criterion level for each target several times; he reached the criterion 12 times for the –ot target, 10 times for the –og target, and 10 times for the –ap target. There was a consistent positive trend for all of the targets during each phase of the intervention. Steven was able to maintain and increase his performance during the transitions from intervention to maintenance phases. His mean scores for the intervention and maintenance phases were significantly higher than the baseline mean scores.

Jared. Jared was unable to read any of the target words at the beginning of the study. He scored zero words read for –ot and –og targets and could not read the –ap target for a
majority of the baseline condition. Jared made significant improvements during the intervention phases for each target; he was able to reach the criterion for each target during the intervention phases. Jared’s baseline mean score across all targets was 0.54 words read. His performance during the intervention phase increased to a mean score of 3.83 and he continued to improve during the maintenance phase to a mean score of 5.71 words read. The data points in the maintenance phases show that Jared increased in his ability to read all of the target words consistently as he was able to read all 18 target words during the last four sessions of the study. Jared’s results for each target during each phase are described below and presented in Figure 4. Mean scores, standard deviation, and range for all targets and conditions are found in Table 6.

–ot target. Jared was unable to read the –ot target during the baseline condition. During the intervention phase, progress towards the criterion was slow and he ranged from zero to five words read; Jared was able to reach the criterion level by reading five of the six target words during the last intervention session. He scored a mean of 2.16 words read during the intervention phase. Jared’s mean score increased to 5.58 during the maintenance phase as Jared continued to read the –ot target consistently, ranging from four to six words read.

–og target. Baseline data shows that Jared could not read any of the –og target words during the baseline phase. Jared again demonstrated improvement during the intervention phase, reading the minimum of five target words to reach the criterion during this phase. He ranged from zero to five words read with a mean score of 3.50. Jared made additional progress in the maintenance phase. His mean score during the maintenance phase increased to 5.83 and he read all six of the –og words during the last five sessions.
Figure 4:

Jared’s results for –ot, –og and –ap targets
**–ap target.** For the first eight sessions during the baseline condition, Jared was consistently unable to read the –ap target. In the subsequent sessions of baseline, Jared improved in his ability to read the –ap target without direct intervention. There were seven overlapping data points between the baseline and intervention phases. His baseline scores ranged from zero to five words read, though his mean remained low at 1.63 words read. The intervention phase increased Jared’s consistent reading of the –ap target; he was able to read all six words for five out of the six intervention sessions. Jared achieved a mean score of 5.83 words read. There was no maintenance phase for this target as it was the last target taught.

Table 6

**Jared’s Mean, Standard Deviation, and Range for all Targets, During Each Phase**

<table>
<thead>
<tr>
<th>Target</th>
<th>Phase</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ot</td>
<td>Baseline</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>2.16</td>
<td>2.00</td>
<td>0-5</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>5.58</td>
<td>0.67</td>
<td>4-6</td>
</tr>
<tr>
<td>-og</td>
<td>Baseline</td>
<td>0.00</td>
<td>0.00</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>3.50</td>
<td>2.07</td>
<td>0-5</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td>5.83</td>
<td>0.41</td>
<td>4-6</td>
</tr>
<tr>
<td>-ap</td>
<td>Baseline</td>
<td>1.63</td>
<td>2.06</td>
<td>0-5</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>5.83</td>
<td>0.41</td>
<td>5-6</td>
</tr>
<tr>
<td></td>
<td>Maintenance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* There was no maintenance phase for the -ap target as this was the last target taught.

Jared’s data from the –ap target shows that there are seven overlapping data points during the baseline phase in which the –ap target was not the target of intervention. Several explanations for this occurrence are provided in the discussion section below. Jared demonstrated upward trends from the baseline to intervention and maintenance phases. Jared reached the criterion level 12 times for the –ot target, nine times for the –og target, and eight
times for the –ap target. He showed significant improvement in his ability to read the target words as a result of the intervention phase for the –ot and –og targets, which may have indirectly influenced his performance on the –ap target during baseline.

**Student Engagement During Instruction**

Quantifiable student engagement ratings were recorded by two research assistants using the Direct Behavior Rating (DBR) scale (Chafouleas et al., 2009). The research assistants rated students’ behaviors in three categories (academically engaged, respectful, and disruptive) by coding 33% of randomly selected videos of the instructional sessions for each student. The tables below represent the ratings recorded for each student. Description of this data; range of scores for each behavior, general trends in behaviors, and explanations of ratings; is provided for each student. The order of the lessons in the table reflects the sequence they were administered in the intervention.

In addition to DBR ratings, the research assistants were asked to make note of any changes in engagement during the SEEL lesson and digital book portions of the intervention. Although a difference in behaviors was observed between the two elements of the intervention, this was not reflected in the students’ DBR ratings. The DBR measure was not intended to make these conclusions but served only as a means of recording student behavior in an objective, succinct, and reliable manner. Thus, engagement comments included below are speculations added to provide additional insight into student engagement and participation. A finer tool should be utilized to further answer questions regarding a comparison of student engagement across the components of the intervention.

**Alyssa.** Analysis of Alyssa’s ratings reveals that the behaviors of academic engagement and respectfulness slightly decreased over the course of the intervention sessions while her
disruptive behaviors increased. Her highest score in the area of academic engagement was 100 while her lowest score was 75 with her highest rating in the earliest recorded session and her lowest rating in the latest occurring session. The research assistants commented that her decrease in engagement was most evident during the iPad segment of the intervention; Alyssa became distractible and lacked focus, evidenced by several off-topic comments and staring at items unrelated to the digital book. She often needed to be redirected by the instructor to attend to the digital book.

Table 7

*Percentage of Each of the Behaviors in the DBR for Alyssa*

<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Lesson Title</th>
<th>Academically Engaged</th>
<th>Respectful</th>
<th>Disruptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td><em>Hot Pot</em></td>
<td>100</td>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td><em>The Dot</em></td>
<td>90</td>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td><em>Frog in the Bog</em></td>
<td>90</td>
<td>90</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td><em>The Frog Jog</em></td>
<td>90</td>
<td>95</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td><em>Rap a Tap Tap</em></td>
<td>80</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td><em>Trap Chap</em></td>
<td>75</td>
<td>80</td>
<td>20</td>
</tr>
</tbody>
</table>

*Note.* Each rating represents the percentage of the total time the student displayed the behavior during the intervention session. Behaviors are rated independently across a session. A lower score for “Disruptive” is desired.

As compared to the digital book portion of the intervention, the instructor requested fewer behavior modifications from Alyssa during the SEEL activities. In addition to a drop in her level of engagement and respectfulness, Alyssa showed more disruptive behaviors in the later treatment sessions. This disruptiveness was characterized by getting out of her seat, fidgeting, and talking about topics unrelated to the task. Although Alyssa demonstrated less desirable ratings in the later sessions viewed, her behaviors did not appear to impact her performance in
reading the target words or decrease her motivation to actively participate throughout the intervention. Alyssa’s behavior ratings are found in Table 7.

Table 8

<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Lesson Title</th>
<th>Academically Engaged</th>
<th>Respectful</th>
<th>Disruptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Hot Pot</td>
<td>85</td>
<td>85</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>The Dot</td>
<td>90</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Frog in the Bog</td>
<td>85</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>11</td>
<td>The Frog Jog</td>
<td>80</td>
<td>85</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>Rap a Tap Tap</td>
<td>75</td>
<td>80</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>Trap Chap</td>
<td>75</td>
<td>85</td>
<td>5</td>
</tr>
</tbody>
</table>

*Note.* Each rating represents the percentage of the total time the student displayed the behavior during the intervention session. Behaviors are rated independently across a session. A lower score for “Disruptive” is desired.

**Tavigk.** Tavigk’s behaviors remained fairly consistent throughout the videos analyzed. There was a slight decrease in academic engagement during the last two lessons reviewed, though overall he maintained respectful behaviors 80 to 95 percent of the time with low occurrences of disruptive conduct (less than 10 percent). Despite somewhat lower ratings in the last two intervention sessions analyzed, Tavigk was generally academically engaged during the course of the intervention. He displayed academic engagement 75 to 90 percent of the time in the intervention sessions. The judges commented that Tavigk’s level of engagement was difficult to decipher because he showed only subtle outward displays of emotion. He was often monotone and with flat facial expression during the intervention sessions. Although he lacked obvious signs of engagement, Tavigk displayed on-task behaviors and intent to participate throughout the activities which indicated that he was engaged in the lesson. He manifested his academic engagement by actively contributing to the activity, listening to instructions, looking at
and engaging in play with the instruction materials, and making comments related to the lessons. Tavigk’s behavior ratings are found in Table 8.

Table 9

<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Lesson Title</th>
<th>Academically Engaged</th>
<th>Respectful</th>
<th>Disruptive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td><em>Frog in the Bog</em></td>
<td>80</td>
<td>85</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td><em>Meet Dog, Frog, and Hog in the Bog</em></td>
<td>75</td>
<td>85</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td><em>The Frog Jog</em></td>
<td>90</td>
<td>90</td>
<td>5</td>
</tr>
<tr>
<td>14</td>
<td><em>Rap a Tap Tap</em></td>
<td>90</td>
<td>90</td>
<td>15</td>
</tr>
<tr>
<td>15</td>
<td><em>Ap Map</em></td>
<td>95</td>
<td>95</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td><em>Ap Cap</em></td>
<td>95</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

*Note.* Each rating represents the percentage of the total time the student displayed the behavior during the intervention session. Behaviors are rated independently across a session. A lower score for “Disruptive” is desired.

**Steven.** The results of Steven’s behavior ratings reveal a steady increase in academic engagement and respectfulness. His academic engagement ratings rose from 80 to 95 percent and his respectful behaviors increased from 85 to 100 percent from the first to the last session analyzed. Steven displayed academic engagement through attending to instructor comments and requests, participating in the activities, contributing relevant comments during the lesson, and focusing his attention on the lesson (activities and materials). He was very considerate towards his peer partner and was compliant with instructions. His lower ratings in academic engagement and respectfulness during earlier sessions may have been influenced by negative behaviors demonstrated by his peer partner; these included speaking over the instructor when not appropriate, getting out of his seat, and talking about topics unrelated to the activity. Steven
occasionally mimicked the actions of his peer and participated in disruptive behaviors. As the intervention continued over successive sessions, Steven’s disruptive behaviors declined from 15 percent to 0 percent of the session. He learned to disregard the negative behaviors of his peer and act more independently during the activities. Steven’s behavior ratings are found in Table 9.

Table 10

Percentage of Each of the Behaviors in the DBR for Jared

<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Lesson Title</th>
<th>Academically Engaged</th>
<th>Respectful</th>
<th>Disruptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Frog in the Bog</td>
<td>85</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>9</td>
<td>Meet Dog, Frog, and Hog in the Bog</td>
<td>80</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>11</td>
<td>The Frog Jog</td>
<td>85</td>
<td>65</td>
<td>35</td>
</tr>
<tr>
<td>14</td>
<td>Rap a Tap Tap</td>
<td>90</td>
<td>80</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>Ap Map</td>
<td>95</td>
<td>90</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>Ap Cap</td>
<td>95</td>
<td>90</td>
<td>10</td>
</tr>
</tbody>
</table>

Note. Each rating represents the percentage of the total time the student displayed the behavior during the intervention session. Behaviors are rated independently across a session. A lower score for “Disruptive” is desired.

**Jared.** Review of Jared’s ratings shows that he made several improvements in all behaviors during the course of the intervention. In the first session analyzed, Jared was rated as academically engaged 85 percent of the time, respectful only 50 percent of the time and disruptive 35 percent of the time. In the latest occurring session reviewed, ratings increased in the area of academic engagement to 95 percent of the time, respectful behaviors to 90 percent of the time and disruptive ratings decreased to only 10 percent of the time. The most significant rating changes recorded were for Jared’s disruptive and respectful behaviors. Jared initially demonstrated disruptive and disrespectful actions such as yelling/talking about unrelated topics, getting out of his seat, and not following directions. Jared benefited from positive remarks from
the instructors and a reward system in which the students were given stars when they were
displaying desirable behaviors. As the instructional sessions progressed, he required less
frequent redirection and fewer reminders to follow instructions. His ability to remain
academically engaged increased to up to 95 percent of the intervention session as he was less
disruptive and more respectful to his peer partner and to the instructor. Jared’s behavior ratings
are located in Table 10.

Discussion
This study investigated the effects of a literacy instruction that supplemented hands-on
literacy activities with reading and writing practice via iPad digital books. This discussion
reflects on major observations and findings related to the integration of digital books in early
literacy instruction and its impact on student engagement and literacy skill attainment.

Factors Impacting Student Performance
The gains that each student made in their ability to read target CVC words was largely
impacted by the intervention using SEEL early literacy lessons and iPad digital books. Although
33% of the targets improved without direct intervention for three of the students, the literacy
skills emphasized in the intervention likely influenced their reading ability and enabled them to
generalize their learning to other targets. The data available above illustrates an increase in
words read from baseline to intervention to maintenance conditions for each of the participants.
At the conclusion of the intervention, all four kindergarteners read a minimum of five out of six
target words for the –ot, –og, and –ap targets. Steven and Jared were able to read 100% of the
target words, Alyssa was able to read 89% of the words, and Tavigk was able to read 83% of the
words. Each student demonstrated significant improvement as compared to their baseline
abilities and ultimately achieved attainment of the targeted CVC words.
The structure of the intervention sessions contributed to the students’ development of the literacy skills necessary for the reading of the targets. The intervention, which consisted of explicitly stated goals, playful interactions, meaningful context, and intense exposure to targets; provided through both the SEEL lesson and the iPad digital books contributed to students’ increased ability to read the target words. The explicit introduction of the target and purpose of the activity prior to beginning each lesson helped the students understand what they were learning and why it was important. The students were given the opportunity to identify the individual letters and sounds composing each target vowel-consonant (VC) word ending. This contributed to their development of phonics skills as they practiced isolating the sounds, associating letters with the sounds, and blending the sounds together to create a recognizable combination (e.g. –o and –t together make –ot).

The students’ phonological awareness skills were also stimulated throughout each activity. They received intense exposure to the VC endings through the engaging hands-on SEEL activities which emphasized meaningful use of the target with rhyme play. The students heard and used the targeted rhyme ending repeatedly throughout each lesson through instructor modeling and opportunities to blend onset and rhyme to create words.

Students’ phonological and phonemic awareness skills were further developed through the additional practice available with the iPad digital books. The digital books reinforced the lessons by providing an alternative way for the students to review the experience and gain additional exposure to the targets. The students were able to see and read the target words in written text. After reading the digital book, they were given the opportunity to brainstorm target words to add to the text. The students made personal contributions to the text as they practiced decoding the sounds of each word and searching for the letters corresponding to the sounds.
The students in the study presented with significant deficits in phonological awareness and phonics skills as compared to their peers. The development of these fundamental skills was encouraged through the intervention, which facilitated their ability to accomplish the task of reading the target words consistently and with confidence. As a result of their increased skills in letter-sound associations, segmenting, and blending the students were able to generalize their learning to other language and literacy tasks within the classroom. The SEEL lessons and iPad digital books helped the students learn to read the targeted CVC words and develop transferable skills that contributed to improved academic success.

**Possible Factors Influencing Student Engagement**

Student engagement was observed through the instructor's online observations (made during implementation of the instructional activities) and two research assistants’ video analyses of these lessons. Because the DBR measure did not lend itself to the comparison of behaviors across the portions of the intervention, the research assistants recorded their observations of student engagement in addition to the DBR ratings. There was consistent agreement between the instructor’s observations and those recorded by the research assistants during their later viewing of the videos. Included below is commentary on student engagement according to the components of the intervention sessions; these components consist of the hands-on SEEL lessons and the follow-up encounter with the iPad digital books.

**SEEL Lessons.** The SEEL lessons provided the students with hands-on experiences with the targets. The students were eager to participate in the intervention each day as they were prepared to have "fun" while learning literacy skills. They were stimulated by the materials, playful nature, and meaningful contexts of each lesson. The SEEL lessons allowed the students
to make meaningful connections with the targets as they were presented in relevant contexts that attracted student interest and participation.

Instead of sitting at their desks completing paper and pencil tasks, the students were able to interact and play while learning. They were exposed to the targets in a variety of ways and settings. The students participated in activities such as passing a hot pot from spot to spot, making a rap with a tap and clap, making crafts to take home such as a cap made from scraps and snaps, or solving problems like jogging over a log and around the bog to catch a frog, or finding which log the frog is hiding under. Each activity provided a fun learning environment that sustained the students’ interest and enthusiasm for learning over multiple intervention sessions. Within the intervention sessions, the students often asked for multiple repetitions of an activity. They also remembered past activities and would ask if they could “play that again.” Through the students’ comments, behaviors, and facial expressions it was evident that the students thoroughly enjoyed the lessons and looked forward to each intervention session.

**iPad Digital Books.** In addition to the SEEL lessons, the students were also enthusiastic about the opportunity to use the iPad as a part of each intervention session. For several of the students in the study, the use of the iPad as a tool for learning was a novel experience. The iPad practice exposed the students to a unique routine regarding the use of technology; the iPad was used only for the reading and writing of digital books.

Initially, the students assumed that the iPad was to be used for games and other non-academic activities. Upon seeing the iPad for the first time, students asked questions such as "Do we get to play games?" and “Oooo [sic] can I play the iPad?” The students were surprised and expressed slight disappointed when they realized that the iPad's use was limited to reading digital books. The Pictello digital book program was unexpectedly limited and lacked
stimulation as it did not provide them with the game-like entertainment that they were expecting. Student responses became somewhat negative, such as "Do we have to do this again?" and “I don’t want to read books,” as a result of discovering that the iPad was not going to be used to play games.

In the first few sessions of the intervention, it also became apparent that the students were overly concerned with taking turns to press the buttons on the iPad. Because the dyads were required to share a single iPad, the students found it essential to create a turn-taking routine for the book reading. Students often said, "It's your turn," or "I went last time" to their peer partner to signal each other’s turn. In many instances, this discussion went back and forth for several exchanges, distracting from the content and purpose of the iPad experience.

Along with taking turns, the students’ attention was focused on pressing buttons on the iPad rather than listening to and reading the important text and material that was being highlighted. This inattention was evident through actions such as holding their hand over the screen in anticipation for turning to the next page or pressing the page so that the voice recording would begin. These actions made the image and text difficult to see, and the constant pressing of the screen caused the digital voice recording to be cut off or repeated inappropriately. Therefore the learning became centered on the technology rather than the learning of the targets through the additional exposure that the iPad provided. Slight adjustments were made to the format of the books to encourage the students to attend to the text rather than focus on the technology. These adjustments included using questions that asked the students to read target words on the page (e.g. “What does this word say?”) or required them to point to target words in the text (e.g. “Find the word tap on this page.”).
The students’ negative attitudes and behaviors towards the iPad appeared to change through the course of the intervention as they understood that reading and writing with the iPad was an enjoyable experience. They realized that the iPad could be used in different, yet still amusing ways, from their original assumptions. The students became satisfied using the iPad to read digital books. They came to understand the options available through the Pictello application that made the experience personal and hands-on. These features included being read the story by the digital recording, turning pages by pressing buttons on the screen, looking at pictures of peers and a picture of themselves in the book, and making their own contributions to the book by typing in words. Their engagement increased when they were given the opportunity to make personal contributions of their own to the books. Students were eager for the hands-on experience of typing words into the digital book and expressed their desire to participate through comments such as, "I want to press a word" “Could I do another one?” and “I like this part.”

Student interest in the digital books was also related to the fact that they encountered stories related to what they experienced. The students recognized the elements found in the text and pictures which reminded them of the activity they completed; for example, one student said “That’s the song that we sang!” upon hearing the lyrics read aloud again in the digital book. The students often wanted to select books from previous sessions. Seeing the title and picture on the title page reminded them of other fun activities in which they participated. The students also made several comments about the pictures in the books being composed of peers participating in the same activity they completed. Particularly interesting to the students were the pictures of the students themselves. The last page of each book was reserved for a picture of the students and they were often eager to reach this page; they pointed to the materials used in the activity and stated what they were doing when the picture was taken.
The instructor’s findings were comparable to those recorded by the research assistants during their after-the-face analysis of the videos. Observations and video analyses indicated that both the SEEL lessons and the iPad digital books were engaging. A consistent finding in engagement measures was the increased engagement during the SEEL lessons as compared to the iPad digital book portion of the intervention. During the SEEL activity the students displayed more interest, focus, appropriate participation and involvement, respectfulness toward the instructor and their peer partner, and less disruptive behavior. Contrasted with the SEEL activity, the iPad experience was less enjoyable for the students. The students were occasionally more distracted and needed increased redirection to extinguish inappropriate behaviors. Instead of being involved in the hands-on learning and use of the targets, the students were more focused on taking turns and tapping the iPad. Additional reasons for their reduced engagement were discussed above. Despite student engagement decreasing slightly from the SEEL activity to the digital book reading on the iPad, students were academically engaged and respectful 75-100% of the time during the intervention session. Students displayed their enjoyment of both aspects of the intervention sessions through their willingness and enthusiasm to participate each day.

Recommendations for Integrating Technology into Early Literacy Instruction

The present study suggests the need to consider several factors for the successful practice of blending face-to-face interaction with technology. In the study, the utilization of digital books as a supplement to instruction was associated with the considerable gains each student made in their ability to read CVC words. The integration of technology with the existing early literacy program of SEEL enhanced the lessons and provided students with the opportunity to review the targets in a different format. Because the students were reading about the activity they had
personally participated in, the digital books activated prior knowledge, engaged readers in the content, and encouraged them to make meaningful contributions to the book reading.

While the results of the study were favorable, there are several implications of integrating technology into early literacy instruction to consider before utilizing technology as an educational resource. Although technology has become a widely accessible and convenient resource, educators must be judicious in the use of technology in the classroom to ensure that it is used reliably. Technology should be used only as a supplement to high-quality classroom instruction to facilitate learning and interaction in a nontraditional way (Banister, 2010; Marsh, 2009). The students in this study were provided with quality instruction throughout the intervention procedures. The SEEL activities introduced the targets and promoted the active involvement of students in learning. The iPad was used for additional practice with the targets that were introduced in the SEEL lessons. The digital books highlighted the target words and provided the extra support and practice the students needed to become better readers. This study demonstrated the benefits of technology used as a supplemental learning resource.

Along with complementing high-quality instruction, it is also important to blend technology with face-to-face interactions. Although technology has many benefits as a stand-alone resource for education, there are several circumstances in which assistance from an adult or peer partner is necessary. The reactions towards the iPad from the students involved in this study suggest that adult guidance is often important to ensure the appropriate use of the technology. Games and other distracters that are easily accessible through technological devices can potentially thwart the advantageous effects of their use. With the students’ limited understanding of using the iPad for academic purposes, is it likely that they would have focused on the literacy material if they used it on their own? Instead, the students benefitted from an
adult model of how the digital books were used. This helped to stimulate their interest in the literacy material and focus their attention on the digital books. Working with an adult and peer partner allowed the students to use the digital book application to learn the material and get additional practice using the targets. Technology serves an important function in academics and sensible implementation of technology blended with peer interaction and teacher instruction can aid students in developing literacy skills.

**Limitations**

Several limitations must be noted in regards to the study. First, it appears that for three of the students, 33% of the targets improved without direct intervention. Generalization did not occur for the same targets for all three students. Steven and Jared experienced baseline improvement for the –ap target during the baseline condition in which the –og ending was the target of intervention. Alyssa demonstrated baseline improvement for the –og target, meaning that improvement in her ability to read the –og words was noted prior to the initiation of the intervention for that target. There are a few possible explanations that account for this spontaneous generalization.

Unanticipated exposure to other targets occurred during all intervention stages as an indirect result of the nature of the instruction. This exposure enabled some of the students to make improvements despite direct intervention. In the SEEL lessons, the individual sounds composing each VC word target are emphasized at the beginning of each lesson and throughout the activities. Therefore, students learned several letter-sound associations that they did not know prior to the intervention. Because there are several overlapping sounds between targets (e.g. short “o”, /g/, /h/, /d/) the students may have improved their ability to read the target words that contained these sounds. For example, it is possible that Alyssa’s generalization to the –og
target during the –ot intervention was a result of her increased ability to identify the short “o” sound (and other consonants), allowing her to read both the –ot and –og targets simultaneously.

Steven and Jared both increased their ability to read the –ap target during the baseline condition in which –og was the target of intervention. For Steven and Jared, exposure to overlapping letters and sounds found in the –ot, –og, and –ap targets such as /p/, /t/, /r/ and /g/ might account for their generalization. The –ot and –og lessons contained similar words and emphasis of sounds which were important to the reading of the –ap target words. Thus, as Steven and Jared became more familiar with these letter-sound associations, they were able to generalize their learning to the –ap target.

Generalization for these students might also be due to improved sound blending abilities. As mentioned above, teaching during these intervention sessions strongly emphasized looking at all of the letters in the words. Students were encouraged to decode each letter and sound and blend them together to make a word. If Jared and Steven knew all of their letter-sound associations (especially the short “a”) it is possible that they were able to use their newly developed skills of decoding and blending to read the –ap word ending. Because –ap was a target introduced earlier in the school year, their ability to blend sounds into words enabled them to read this familiar target when it was not the target of intervention.

A second limitation to be noted is Tavigk’s inconsistent performance and his score of 0 on the final day of –og intervention. Throughout the –og intervention, Tavigk expressed difficulty recognizing the sound of the letter “g”. Although it was a familiar letter to him because it was in his name, he struggled to remember and associate the sound with the letter because it was a silent letter in his name. He often commented about the letter, “This one is hard” or “It confuses me.” Because of this difficulty, the instructor took specific opportunity to
re-teach and emphasize the letter-sound association for “g” throughout the –og intervention. Despite appearing to understand and appropriately use the letter “g” correctly, Tavigk displayed unsatisfactory performance during the assessments.

In addition to his problem learning the sound for “g,” Tavigk struggled to stay motivated to participate in the intervention sessions. His variable attitude towards participation was influenced by external factors that the researchers worked on controlling. For example, Tavigk told the researchers that he did not like to come out to do the lessons because he missed the instructions for center time while participating in the intervention; he was worried about not knowing what to do when he went back to class. To alleviate this issue, the researcher talked to his teacher before class to get the instructions for center time. These instructions were given to Tavigk following the intervention session to reduce his anxiety upon returning to class. Tavigk’s teacher also pointed out to the researcher that Tavigk disliked being pulled out of class for “special instruction.” He did not like to be singled out from his peers in any way and the intervention required him to leave his peers several times a week. Tavigk was provided with additional prizes and incentives to encourage him to participate in the intervention. His frustrations with being pulled out of class and difficulty with particular sounds such as the letter “g” likely lead to his inconsistent performance throughout the intervention.

Third, the design of the study required the students to participate in continuous assessments. The students had to take an assessment following each intervention session in order for the researcher to consistently monitor their performance. The students expressed that they did not like doing the assessments each day despite being rewarded for completing them. The lack of incentive to take the assessment may have resulted in an inaccurate representation of student reading abilities. Tavigk in particular was very negative about the assessments and was
not persuaded by prizes. During the assessments, he was often very distracted, tried to get out of the task by talking to the instructors, and became easily frustrated if he felt he was performing poorly. Alyssa, Steven, and Jared were generally easier to entice to participate by being offered prizes. The degree of motivation from each student during the assessment portion of the intervention must be considered as a factor that possibly altered student performance.

Fourth, the generalization of the study is limited to students who have the very same profiles as the students involved in the study. Each participant possessed individual differences that may not be found in other populations of students. The purpose of the study was to observe the individual changes in behavior before and after the implementation of the intervention, and further research will help reveal if the effectiveness of the intervention is found in students with different profiles. Although much can be taken from the results found for these four students, the interpretation of the results is limited in its impact to other kindergarten populations.

The fifth and final limitation to the validity of the study is the varied instructional format the students received. The study’s design was constructed so that instruction was to occur in dyads with paired peer learning. The students did not receive all instruction in dyads because multiple absences necessitated one-on-one instruction sessions. The one-on-one instruction allowed the student to receive more attention and personalized instruction than in the dyad. In the dyads, the instructor balanced the needs and behaviors of both students and the instruction resembled a more realistic approach to tier 3 intervention. This inconsistency must be noted in the interpretation of the results.

Future Research

There are many possible avenues for future research concerning the integration of technology in early literacy instruction. Because technology is an increasingly popular resource
for education, continued investigation must be performed to ensure that the methods for the use
of technology in the classroom are based on sound principles and reliable evidence. Further
examination of the blending of technology with face-to-face interaction and high-quality
instruction is important given the presence of technological resources in the classroom.

One factor to consider in additional studies is the influence of the hands-on portion of the
intervention as compared to the technology-delivered aspect. Because both the hands-on and
technological portions were administered in the same session and with all of the participants, the
relative effect of each cannot be determined. It would be useful to identify what part of the
intervention impacted student attainment of literacy skills the most.

Another element of the present investigation that deserves attention is the various features
included in the personalized technology component. In designing the digital books, the
researcher personalized them to provide the students with meaningful and relevant opportunities
to read and write about the hands-on SEEL activity. The technology aspect thus included
customized features such as digital voice recordings, peer pictures, pictures of the students
themselves, familiar topics, and a fit between the goals of the lesson and the book. A study
focusing on the technology may help distinguish the most influential component that aided
students in learning to read the target vocabulary words.

Continued exploration with the iPad can help provide instructors with ideas for classroom
use. The format of the digital books in the study utilized the voice recording format in which the
text of the books was read aloud to the students. Another format to consider is requiring the
students to read the text directly from the book, with assistance from the instructor as needed.
Different iPad applications that are more engaging and interactive, highlight important aspects of
the text, or provide additional features to enhance the learning of targets should be developed and tested to provide teachers with helpful options to use to supplement their instruction.

Additional research should also include more students of differing abilities and backgrounds. This can lead to expanded conclusions verifying whether technology is a reliable resource to support struggling or at-risk students in attaining literacy skills. It is essential to continue to find ways in which technology can be used to supplement classroom learning. Technology has the potential to provide students with additional practice and exposure to targets while keeping them motivated and engaged in learning.
References


Levy, R. (2009). 'You have to understand words ... but not read them': young children becoming readers in a digital age. *Journal of Research in Reading, 32*(1), 75-75-91.


Appendices

Appendix A

Informed Consent

Systematic and Engaging Early Literacy Intervention
Consent to be a Research Subject

Participant Consent

Introduction
This research study is being conducted by Kendra Hall and Barbara Culatta with assistance from students at Brigham Young University, to investigate the effects of using Systematic and Engaging Early Literacy (SEEL), as a literacy intervention for students needing extra literacy support.

Procedures
Your child will participate in SEEL activities 3 days per week in a small group of 2 students, for approximately 4-6 weeks. Each session will last approximately 20 minutes and will include having children encounter engaging reading and writing activities presented on an iPad. Your child will be assessed on his/her ability to read 18 3-letter words approximately 4 times before the intervention sessions begin and after each intervention session. Your child will also be asked to identify the meanings of two or three words that will be taught during the reading instruction.

Intervention sessions will be video recorded and 30% of them will be watched by 2 research assistants, to determine accuracy of SEEL teaching by the instructor. Similarly, assessment sessions will be video recorded and 30% of them will be watched by 1 research assistant to ensure reliability in assessment practices and agreement in results. Video recordings of the assessment sessions will not be used for future purposes and will be destroyed following data collection. However, video recordings of the intervention sessions may be used for future training and professional development. If you are willing to allow the video footage of the intervention sessions to be used for this purpose, please sign your name here:____________________

Immediately following each intervention session your child will be asked what he/she thought of the activity by circling the picture that most accurately describes how they feel.

Risks/Discomforts
There are minimal risks for participation in this study. However due to repeated assessments, your child may experience assessment fatigue and/or frustration. During baseline assessment it is anticipated that your child will not be able to read the words at all, and so may feel a little uncomfortable. To counteract these possible risks your child will be told that he/she may not be able to read these words yet and it is okay to say, “I don’t know.” Furthermore, a small prize (e.g., a sticker or a small candy) will be given to your child no matter how he/she performs in the assessment.

Benefits
It is anticipated that the literacy intervention will improve your child’s literacy skills and help your child in learning to read.

Confidentiality
All information provided will remain confidential and will be reported using pseudonyms. All data will be kept in a secure place and only those directly involved with the research will have access to them.

Questions about the Research
If you have questions regarding this study, you may contact Kendra Hall at (801) 422-4439 or Kendra_Hall@byu.edu. Contact Audra Hales at 619-204-1987 or audra@audrales@gmail.com

Brigham Young University IRB
APPROVED

REC 2/9/2011 MAR 6/6/2012
Questions about your Rights as Research Participants
If you have questions regarding your rights as a research participant, you may contact IRB Administrator, Brigham Young University, A-285 ASB Campus Drive; Provo, UT 84602; (801) 422-1461; irb@byu.edu.

Participation
Participation in this research study is voluntary. You have the right to withdraw your child at any time or refuse to allow him/her to participate entirely without any consequence.

I have read, understood, and received a copy of the above consent and desire of my own free will to allow my child to participate in this study.

Signature: _______________________________ Date: ___________
Appendix B

Photo Release

David O. McKay School of Education

Permission Release

Re: Multimedia Capture and Distribution

This is to confirm that I am aware of and consent to the capture of printed, audio, video, and still images, of [redacted] for the David O. McKay School of Education ("McKay School") on [redacted].

I further agree that the media can be reproduced, in whole or in part, in any communication medium used by the McKay School for distribution in its promotional, instructional, or development products.

Signature: ______________________  Date: ______________________

Print Name: ____________________

Address: _________________________

Phone: _________________________

☐ Parent or Guardian of child listed above

331 MCKII, BYU, Provo, UT 84602
(801) 422-8562/ FAX (801) 422-0200
Appendix C

Assessment Check Sheet

I’m going to ask you to try to read some words. I may not have taught you to read all of the words yet, so if you don’t know how to read a word that’s okay, just say, “I don’t know” and move onto the next word by pressing this button. When you’re done you’ll get a prize, even if you don’t know the words. Now do your best reading.

<table>
<thead>
<tr>
<th>Date:</th>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| -ot words |       | -ot words |       |
| dot |       | dot |       |
| pot |       | pot |       |
| hot |       | hot |       |
| not |       | not |       |
| rot |       | rot |       |
| got |       | got |       |

| -og words |       | -og words |       |
| dog |       | dog |       |
| hog |       | hog |       |
| log |       | log |       |
| bog |       | bog |       |
| fog |       | fog |       |
| jog |       | jog |       |

| -ap words |       | -ap words |       |
| cap |       | cap |       |
| gap |       | gap |       |
| lap |       | lap |       |
| map |       | map |       |
| rap |       | rap |       |
| tap |       | tap |       |
Appendix D

Raw Data

Alyssa
Correct CVC Words

Sessions

Baseline  S.E.E.L  Maintenance

-OT

-OG

-AP
Jared
Appendix E

DBR Standard Form

Direct Behavior Rating (DBR) Form: 3 Standard Behaviors

<table>
<thead>
<tr>
<th>Date:</th>
<th>Student:</th>
<th>Activity Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>M T W Th F</td>
<td>Rater:</td>
<td></td>
</tr>
</tbody>
</table>

Observation Time:
Start: __________
End: __________

☐ Check if no observation today

Behavior Descriptions:

**Academically engaged** is actively or passively participating in the classroom activity. For example: writing, raising hand, answering a question, talking about a lesson, listening to the teacher, reading silently, or looking at instructional materials.

**Respectful** is defined as compliant and polite behavior in response to adult direction and/or interactions with peers and adults. For example: follows teacher direction, prosocial interaction with peers, positive response to adult request, verbal or physical disruption without a negative tone/intonation.

**Disruptive** is student action that interrupts regular school or classroom activity. For example: out of seat, fidgeting, playing with objects, acting aggressively, talking/yelling about things that are unrelated to classroom instruction.

Directions: Place a mark along the line that best reflects the percentage of total time the student exhibited each target behavior. Note that the percentages do not need to total 100% across behaviors since some behaviors may co-occur.

**Academically Engaged**

<table>
<thead>
<tr>
<th>% of Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Never</td>
</tr>
</tbody>
</table>

**Respectful**

<table>
<thead>
<tr>
<th>% of Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Never</td>
</tr>
</tbody>
</table>

**Disruptive**

<table>
<thead>
<tr>
<th>% of Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
</tr>
<tr>
<td>Never</td>
</tr>
</tbody>
</table>

* Remember that a lower score for “Disruptive” is more desirable.
Appendix F

SEEL Treatment Fidelity Check Sheet

<table>
<thead>
<tr>
<th>Meaningful</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Was the activity appropriate for kindergarten age children?</td>
<td></td>
</tr>
<tr>
<td>b. Did the instructor link the activity to students’ prior knowledge and experience?</td>
<td></td>
</tr>
<tr>
<td>c. If necessary did the instructor illustrate the meaning of target words to students?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Explicit</th>
<th>Yes/No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Did the instructor explicitly state the target at the beginning of the lesson?</td>
<td></td>
</tr>
<tr>
<td>b. Did the instructor restate the target throughout the activity?</td>
<td></td>
</tr>
<tr>
<td>c. Did the instructor model the target and the activity for students?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Playful and Engaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Was the instructor playful with the students?</td>
</tr>
<tr>
<td>None of the time</td>
</tr>
<tr>
<td>b. Did the instructor encourage the students to be playful?</td>
</tr>
<tr>
<td>None of the time</td>
</tr>
<tr>
<td>c. Were the students actively involved?</td>
</tr>
<tr>
<td>None of the time</td>
</tr>
<tr>
<td>d. Did the students appear to enjoy the activity?</td>
</tr>
<tr>
<td>None of the time</td>
</tr>
<tr>
<td>e. Did students appear to be engaged in the activity?</td>
</tr>
<tr>
<td>None of the time</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intense exposure to targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many times did you hear the instructor use the target words and sounds each minute of the activity?</td>
</tr>
<tr>
<td>1 min</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>Were students given opportunities to use the target words and sounds, e.g., through conversation, songs, chants, reading, and writing?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reciprocal exchanges</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Did the instructor listen to the students and respond to their actions and comments?</td>
</tr>
<tr>
<td>None of the time</td>
</tr>
<tr>
<td>b. How many times did you see this occur?</td>
</tr>
</tbody>
</table>