6-2017

Do Spellings of Words and Phonemic Awareness Training Facilitate Vocabulary Learning in Preschoolers?

Robin O'Leary

The Graduate Center, City University of New York

How does access to this work benefit you? Let us know!

Follow this and additional works at: https://academicworks.cuny.edu/gc_etds

Part of the Cognition and Perception Commons, Curriculum and Instruction Commons, Early Childhood Education Commons, Educational Psychology Commons, Language and Literacy Education Commons, and the Pre-Elementary, Early Childhood, Kindergarten Teacher Education Commons

Recommended Citation

https://academicworks.cuny.edu/gc_etds/2137

This Dissertation is brought to you by CUNY Academic Works. It has been accepted for inclusion in All Dissertations, Theses, and Capstone Projects by an authorized administrator of CUNY Academic Works. For more information, please contact deposit@gc.cuny.edu.
DO SPELLINGS OF WORDS AND PHONEMIC AWARENESS TRAINING FACILITATE VOCABULARY LEARNING IN PRESCHOOLERS?

by

ROBIN O’LEARY

A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

2017
Do Spellings of Words and Phonemic Awareness Training Facilitate Vocabulary Learning in Preschoolers?

by

Robin O’Leary

This manuscript has been read and accepted for the Graduate Faculty in Educational Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

Date Linnea C. Ehri

Chair of Examining Committee

Date Bruce D. Homer

Executive Officer

Supervisory Committee

Linnea C. Ehri

Dolores Perin

Alpana Bhattacharya

THE CITY UNIVERSITY OF NEW YORK
ABSTRACT

Do Spellings of Words and Phonemic Awareness Training Facilitate Vocabulary Learning in Preschoolers?

by

Robin O’Leary

Advisor: Linnea C. Ehri

The purpose of this study was to examine the contribution of phoneme awareness training and orthography to the learning of new vocabulary words by partial alphabetic phase readers. We hypothesized that four and five year old children taught to segment words with letters would outperform those trained with shape markers and those that received no segmentation training on an invented spelling task. We also hypothesized that students seeing the spellings of new vocabulary words (names) would learn the words in fewer trials, remember the names and features better and would be able to better recognize letter labels when presented alone.

An experimental counterbalanced design was used. Children were screened to select readers in the partial alphabetic phase. They were assigned randomly to one of three conditions. Children were given training in phonemic awareness by learning to segment simple words with letter markers or shape markers. A third control condition was read a rhyming book and no segmentation was taught. Children were then taught new vocabulary words naming interesting and unusual drawings of characters. Half of the drawings were accompanied by simple consonant-vowel spellings symbolizing their names and half by unrelated two-digit numbers in a
repeated measures design. Students were given up to 20 learning trials with corrective feedback to learn the picture-name associations.

Results indicated that children who received phonemic segmentation training with letters made significant gains from pretest to posttest in producing simplified spellings of words whereas the other two groups who were not trained with letters showed no improvement. In the vocabulary learning task, results revealed that when participants were shown spellings of the words during study periods but not during tests, they required fewer trials to learn the words than when they were shown irrelevant numbers. Phonemic segmentation training with letters did not improve vocabulary learning compared to training without letters or rhyme training. Findings showed that beginning readers’ memory for vocabulary words can be facilitated when they are exposed to spellings of the words, even beginners in the partial alphabetic phase of reading development. Knowledge of letter names containing the relevant sounds in their names appeared to be sufficient to support facilitation of vocabulary learning from spellings but training in phoneme segmentation provided no additional benefit.
Table of Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Literature Review</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Early Literacy Experiences for Emergent Readers</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Phonological and Phonemic Awareness</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Current Curricula, Expectations and Standards</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Common Core Standards for Pre-Kindergarten</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Phases of Development in Learning to Read Words</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Letter Name Knowledge</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Phonemic Segmentation Training</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Orthographic Knowledge and Mnemonic Value for Vocabulary Learning</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>Pilot Study, Rationale and Hypotheses</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Pilot Study</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Rationale</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Hypotheses</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>Method</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Participants</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td>Pretests</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Letter Identification</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Number Recognition</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Word Reading</td>
<td>45</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Non-word Decoding</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Invented Spelling Pretest</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Training Conditions</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Phonemic Awareness (PA) Training</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Rhyming</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Posttests</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Invented Spelling</td>
<td>52</td>
<td></td>
</tr>
<tr>
<td>Vocabulary Learning Tasks</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>Recalling Names of Drawings</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Recalling Names Associated with Spellings and Numbers</td>
<td>57</td>
<td></td>
</tr>
<tr>
<td>Recalling Features of Drawings</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Data Analyses</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>5 Results</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Characteristics of Participants</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Phonemic Awareness Training</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>Vocabulary Learning</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Correlational Analysis</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td>6 Discussion</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Summary of Results</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Phonemic Segmentation Training</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td>Orthographic Knowledge</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Strengths and Limitations</td>
<td>87</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td>Future Directions and implications For Practice</td>
<td>88</td>
<td></td>
</tr>
</tbody>
</table>

**Appendixes**

<table>
<thead>
<tr>
<th>A</th>
<th>Data Collection Sheet</th>
<th>93</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Scripts</td>
<td>98</td>
</tr>
<tr>
<td>C</td>
<td>Parental Permission</td>
<td>113</td>
</tr>
<tr>
<td>D</td>
<td>Child’s Oral Assent</td>
<td>115</td>
</tr>
<tr>
<td>E</td>
<td>Cover Letter for Parents</td>
<td>116</td>
</tr>
</tbody>
</table>

References 117
## List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Student Distribution in Phonemic Segmentation Based on School Site</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>Characteristics of Children, Means, and Standard Deviations for Phonemic Awareness Training Pretests</td>
<td>61</td>
</tr>
<tr>
<td>3</td>
<td>Analysis of Variance for Phonemic Awareness Training, Vocabulary Measures and Posttest Measures</td>
<td>67</td>
</tr>
<tr>
<td>4</td>
<td>Means and Standard Deviations of the Phonemic Awareness Letter and Shape Training Groups and the Rhyming Control Group in the Invented Spelling and Vocabulary Learning Tasks</td>
<td>69</td>
</tr>
<tr>
<td>5</td>
<td>Vocabulary Learning: Preliminary Analysis of Variance of Letter vs. Number Difference Score on Trials to Criterion Measure as a Function of Task Order and Word Set</td>
<td>71</td>
</tr>
<tr>
<td>6</td>
<td>Analysis of Variance of Name Learning Over 15 Trials</td>
<td>72</td>
</tr>
<tr>
<td>7</td>
<td>Correlations Between PPVT-4 and Posttest Measures</td>
<td>76</td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>1</td>
<td>Mrs. Magic Mouth and Elkonin Boxes used for Segmentation Training</td>
<td>51</td>
</tr>
<tr>
<td>2</td>
<td>Animal Drawings, Labels and Features</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>Face Drawings, Labels and Features</td>
<td>56</td>
</tr>
<tr>
<td>4</td>
<td>Mean Number of Names Recalled In Word Learning Task Over 15 Trials</td>
<td>73</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction

The purpose of this study was to explore the contribution of orthography and phonemic segmentation training to the learning of new vocabulary words in partial alphabetic phase readers. Questions of interest were (1) whether preschoolers and kindergartners who are not yet reading would utilize letter name knowledge to benefit from segmentation training more than those not taught with letters, and (2) whether as a result letter trained segmenters would show greater orthographic facilitation of vocabulary learning than the comparison groups. Using a series of developmentally appropriate learning tasks, we sought to demonstrate that children are not only capable of understanding letter sound correspondences, but also can show improved performance when taught by direct, enjoyable teaching methods.

Learning to read is an important milestone that facilitates learning throughout a child’s life. Failing to give children literacy experiences until they are in school can severely limit the reading and writing levels they ultimately attain (Neumann, Copple & Bredekamp, 2000). However, there is still much disagreement as to what type of experiences and instruction are appropriate for children in preschool. Various early childhood organizations and prekindergarten curricula recommend only a general awareness and unsystematic exploration of literacy activities for preschool children; including shared story book reading, rhyming and syllable games and a general discussion of some letters and letter-sound matches (Neumann et al., 2000). Many educators believe it is not developmentally appropriate to include systematic instruction of letters and the sounds they represent before kindergarten or even first grade (Neumann et al.; Dodge, Colker & Heroman, 2002; Yeh & Connell, 2008).
Conversely, multiple experimental and correlational studies have shown that letter knowledge, phonological awareness and phonemic segmentation ability at the start of kindergarten are the strongest predictors of later reading achievement (Share, Jorm, MacLean & Matthews, 1984; Juel, Griffith & Gough, 1986; National Early Literacy Panel, 2008). Children given early training in phonemic awareness and alphabetic coding show superior outcomes on measures of word recognition and later comprehension abilities (Roberts & Meiring, 2006).

Historically, reading has been taught in the first grade with the teaching of difficult individual letter-sound correspondences spread over time (Adams, 1990). Currently, however, children in the New York City Public School system (and others around the country) are expected to be reading and writing before the middle of the kindergarten year (Fountas & Pinnell, 2015). Yet the teaching of component skills is limited or altogether lacking in many preschool settings. Educators and policy makers often discuss the skills children should possess or spontaneously generate (Neumann et al., 2000; Copple & Bredekamp, 2009; Dodge et al., 2002; New York State Education Department, 2011) but the emphasis on how children acquire these emergent skills and what to specifically teach appears to be deficient.

The National Early Literacy Panel (NELP, 2008) and the National Reading Panel (NICHD, 2000) both provide strong evidence from their meta-analyses that instruction in phoneme segmentation in preschool is highly effective. Knowledge and skills that include alphabet knowledge, phonological awareness, rapid automatic naming, name writing and phonological memory measured before the beginning of kindergarten are strongly correlated with later success in reading (NELP, 2008). However, most preschool curricula and curricular advisers continue to maintain that young children are not developmentally ready for instruction in phonemic awareness and only recommend rhyming and oral vocabulary activities. Many even
discourage the identification of letter names and individual sounds, believing that children will make connections through exposure to predictable storybooks, drawing, and dictation activities with only an incidental discussion of the alphabetic code and sound correspondences (Dodge et al., 2002; Epstein, Hohmann & Hohmann, 2002; New York State Education Department, 2016). Incorporating phoneme segmentation and blending activities are often delayed until kindergarten or first grade, or not taught at all (Yeh & Connell, 2008).

The ease with which children learn to read an alphabetic script is influenced by their awareness of sounds and letter names. This process of learning, however, proves complicated and confusing for many young children. Adams (1990) explains that both graphemes and their phonological correspondences are meaningless, perceptually sparse, and piecewise confusable. Most children enter preschool or kindergarten with substantial competence speaking language, but typically have little knowledge about how to read and write (Adams, 1990; Seidenberg, 2017). The purpose of beginning literacy instruction in school is to help children master the challenge of connecting their spoken language to the initially arbitrary symbols on a page. Disagreement has centered on when training should happen and whether the teaching of symbol-sound correspondences should be explicit or whether it should be meaning centered, with grapheme-phoneme correspondences taught incidentally in a whole-language context as the need arises (Ehri, Nunes, Stahl & Willows, 2001).

With the adoption of Common Core Standards (New York State Education Department, 2011) for school aged children, New York State has developed aligned standards for prekindergarten as well. These standards suggest that prekindergarten students should “Demonstrate awareness of relationship between sounds and letters, isolate and pronounce the initial sounds in words (and) demonstrate emergent phonics and word analysis skills. With
prompting and support (prekindergarten students should) demonstrate one-to-one letter-sound correspondence by producing the primary sounds of some consonants” (pp. 21-22). The Common Core Standards suggest prekindergarten children should be able to “Demonstrate emergent phonics and word analysis skills”, but the concepts of emergent phonics and word analysis go beyond that of phonological or phonemic awareness. Phonics calls for specific connections to be made between the graphemes in print and phonemes in spoken language. These requirements and skills seem disconnected from the most commonly used preschool curricula that call for practice in rhyming games and incidental exposure to letters through reading stories aloud with no clear pathway for the teaching learning or understanding of grapheme-phoneme connections that contribute to later reading success (Dodge et al., 2002; Epstein et al., 2002; NYS Education Department, 2016). Many early childhood teachers cannot appropriately define phonemic awareness, emergent phonics and word analysis skills, or design and carry out activities that promote them (Moats, 2000, Moats, 2009b; Moats & Foorman, 2003, Yeh & Connell, 2008). Teacher inhibitions about the developmental appropriateness of directly instructing students in letter-sound relationships may lead to ineffective instruction or no instruction in this area (Yeh & Connell, 2008).

Ehri's connectionist theory (Ehri, 1992, 2005) explains that when formal reading instruction begins, students already possess substantial linguistic competence with speech. The remaining issue is how to incorporate printed language into existing knowledge. According to the theory, each word unit has several identities. Phonological identities represent how words are articulated and sound. Syntactic identities represent how words are used in sentences and semantic identities represent the meanings of words. All of these identities are present when young children acquire language. Orthographic identities, which are graphophonemic images or
spellings of words are not acquired until children begin the process of learning to read. Eventually, all of these identities are amalgamated or combined in lexical memory for individual words (Ehri, 1992, 2005).

In The Mnemonic Value of Orthography for Vocabulary Learning study conducted by Rosenthal and Ehri (2008), they found that spellings activated graphophonemic connections to better secure pronunciations and meanings of new vocabulary words in memory. Second and fifth graders learned and remembered the pronunciations and meanings of new vocabulary words better when they were exposed to spellings of the words during their study trials than when they only heard and repeated the words. Evidence of this improvement was shown by fewer word learning trials needed to reach criterion, as well as better memory on the delayed posttests. Improvements were also not limited to one developmental level, because the results were consistent in both the second and fifth grades. Higher level fifth graders with more orthographic knowledge benefitted even more from the spellings, and made successively greater gains in each trial than did lower level readers.

The current study was patterned, in part, after Rosenthal and Ehri’s (2008) study. In order to understand whether orthography would secure pronunciations and meanings of new words in the memory of preschoolers and early kindergartners, simplified orthography accompanied cartoon like drawings of familiar animals and faces. Rather than finding low frequency real words and providing definitions (Rosenthal & Ehri, 2008), each drawing was given a simplified consonant-vowel (CV) name to represent learning a new vocabulary word. Salient features of the drawings were provided verbally during each learning trial to represent the definitions or meanings of new words.
With the current expectation that kindergartners will quickly develop the ability to read and write, more research is needed to ascertain whether younger emergent readers will benefit from seeing letters and spellings or whether this extra information may overwhelm their ability to develop phonological and phonemic awareness. Encouraging preschoolers to begin to carefully consider letter symbols and their connections to the sounds already known in language may generate increased benefits beyond just remembering letter-sound connections. Recognizing letters and connecting them to sounds may provide a mnemonic pathway that helps even pre-readers begin to make orthographic connections that can secure the meanings of written words in memory. Including appropriate, integrative, and enjoyable instruction in letter names, as well as phonemic awareness training that includes segmenting phonemes in preschools seems essential to allow children to meet the expectations of today’s assessments and Common Core Standards.

Expectations for reading in kindergarten are now higher than ever with performance assessments given within the first few months of school. However, the teaching of emergent literacy skills in preschool and early kindergarten is often ineffective or altogether lacking. Various studies have suggested that children who enter kindergarten with the ability to segment words into sounds and to identify the names or sounds of letters progress faster than children who do not possess this knowledge (Share, 2004; National Institute of Child Health & Human Development, 2000; National Early Literacy Panel, 2008). In addition, children who are taught simple segmentation skills when first starting to read also make better progress (Ehri, Nunes, Willows, Schuster, Yaghoub-Zabeh, & Shanahan, 2001).

To examine the contribution of phonemic segmentation to vocabulary learning supported by exposure to spellings in partial alphabetic phase readers, the current study used a repeated measures, counterbalanced design with random assignment. Students who qualified as partial-
alphabetic phase readers were taught to segment words into phonemes in one of three conditions (with letter tokens, with shape tokens, or with no segmentation rhyming training) and then completed two vocabulary learning tasks, one task showing spellings symbolizing phonemes in the words being learned and one task showing unrelated number labels. Students were given several trials to learn the words. They were shown spellings or numbers during study periods but not when their memory for the words was tested. One day after learning each set of words, students were given several posttests to assess what they remembered about the words they learned. These tests included their ability to recall names of drawings, to recall the pronunciations of the names associated with the spellings and numbers seen during the word learning trials, and to recall meanings of the names by describing features of the drawings. We also considered the number of trials needed to complete the phonemic awareness training and to learn the names and features of each set of drawings in our analysis of results. We hypothesized that students receiving segmentation training with letter tokens and observing spellings during vocabulary learning trials would be able to remember significantly more new words, in fewer trials and to better connect the spellings to words learned than students in other treatments.
Chapter 2

Literature Review

Early Literacy Experiences for Emergent Readers

Learning to read is an important milestone that facilitates learning throughout a child’s life. Failing to give children literacy experiences until they are in school can limit or delay the reading and writing levels ultimately attained (Neumann et al., 2000). There remains, however, a great deal of conflict and disagreement as to what type of experiences and instruction are appropriate for emergent readers. Most early childhood organizations and prekindergarten curricula recommend only a casual, unsystematic exploration of literacy concepts; including shared story book reading, rhyming and syllable games, and a general, unspecified discussion of some letters and letter-sound matches. Many educators believe it is not developmentally appropriate to include direct, systematic instruction of letters and the sounds they represent before kindergarten or even first grade (Neumann et al.; Dodge et al., 2002; Epstein et al., 2002; NYS Education Department, 2016).

Conversely, multiple experimental and correlational studies have shown that letter knowledge, phonological awareness and phonemic segmentation ability at the start of kindergarten are the strongest predictors of later reading achievement (Share et al., 1984; Juel et al., 1986; National Early Literacy Panel, 2008). Children given early phonemic awareness training and direct alphabetic coding instruction show superior outcomes on measures of word recognition and later comprehension abilities (Roberts & Meiring, 2006). In today’s demanding academic climate children are now expected to be reading and writing by the middle of kindergarten, with the comprehension of a variety of subject area texts necessary by the third
grade (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010).

However, teaching preschoolers the tools and knowledge needed to be ready for current kindergarten standards remains a contentious point. Many early childhood educators and curricula developers are advised by the National Association for the Education of Young Children (NAEYC). The NAEYC maintains, in their various position statements (Neumann, et al., 2000; Copple & Bredekamp, 2009), that the direct instruction of letters, sounds, phonemes, segmenting and blending is not developmentally appropriate practice for young children and prefer to focus on incidental rhyming activities or memorizing whole words by sight. They maintain that children will make connections through exposure to predictable or rhyming storybooks, drawing, and dictation activities with only an incidental discussion of the alphabetic code and sound correspondences (Dodge et al., 2002; Epstein, et al., 2002; Neuman et al., 2000; Copple & Bredekamp, 2009). The current study assessed letter name knowledge and delivered direct, developmentally appropriate instruction in phonemic awareness and segmentation to young children in order to assess its contribution to learning new vocabulary.

**Phonological and Phonemic Awareness**

The terms phonological and phonemic awareness are often used interchangeably or substituted for each other, but they are quite different. Phonological awareness is the larger, more over-arching term that refers to, not only an awareness of single sounds, but also larger units like syllables and words that rhyme (Ehri & Roberts, 2006). Often, early childhood educators will recommend practice with rhyming songs or finger plays, onset-rime awareness or clapping and tapping syllables for preschool students. Reading aloud to children has long been viewed as an important aspect of encouraging language and literacy development (Adams, 1990). However, it
remains uncertain if reading story books aloud to children or practicing phonological awareness skills through syllable differentiation and rhyming activities will lead to the development of subsequent reading ability (Byrne & Fielding-Barnsley, 1991; Xu, Chin, Reed & Hutchinson, 2014; Delaney & Neuman, 2016; Seidenberg, 2017).

Phonemes are the smallest units of sound in speech and phonemic awareness refers to the ability to manipulate phonemes in spoken words. For example, understanding that the word “stop” has four phonemes (/s/-/t/-/a/-/p/) and being able to isolate those phonemes within words; determining that “stop” without the initial phoneme /s/ now becomes “top.” Although phonemic awareness applies to spoken language, its function is to enable beginners to connect speech to print (Ehri & Roberts, 2006). Making connections between phonemes in spoken words and graphemes in spellings of words by segmenting words into phonemes is an important component of learning to read. Young children can be encouraged to phonemically segment sounds in words orally, using blank tokens to hold the space for each phoneme, or they can be taught to segment and connect these sounds utilizing letters. Studies show that children who are taught to segment sounds in pronunciations of words and associate sounds with letters make faster progress in learning to read in the first two years of instruction than those children who lack these capabilities (Share et al., 1984; Juel et al, 1988, NELP, 2008, NICHD, 2000, Seidenberg, 2017). Children who lack phoneme segmentation and blending skills upon entering first grade are likely to be poor readers in the fourth grade (Juel, 1988; Roberts & Meiring, 2006).

Phonics instruction incorporates phonemic awareness ability and includes the process of linking sounds to letters and combining them to make words. Roberts and Meiring (2006) compared explicit systematic phonics instruction to incidental phonics embedded in a literature based approach. In a longitudinal study beginning in first grade and ending in fifth grade,
children receiving explicit phonics instruction did significantly better when phonetically spelling real and pseudo-words, reading real and pseudo-words, and writing longer stories. At the end of fifth grade, the children who had received explicit systematic phonics instruction had significantly higher comprehension scores than did students taught within a literature based approach.

The National Reading Panel (2000) states that explicit, systematic phonics instruction helps children to read better than unsystematic or no phonics instruction, with the largest effect sizes involving studies of prekindergarten and kindergarten students. When phonics instruction began in kindergarten and continued into the second grade, effects on learning to read and write were sizeable and persisted. A later introduction of phonics instruction appears to be less effective, perhaps because students have already acquired some reading skill and it may be more difficult to influence and change ineffective habits that have already been acquired and reinforced (Ehri et al., 2001; National Reading Panel, 2000).

**Current Curricula, Expectations and Standards**

Historically, reading has been taught in the first grade with the teaching of difficult individual letter-sound correspondences spread over time (Adams, 1990). Currently, however, children in New York City Public Schools (and other cities around the country) are expected to be reading and writing by the middle of the kindergarten year, as evidenced by the Instructional Level Expectations for Reading by Fountas and Pinnell (2015). They state that by mid-year, students receiving a rating of “meet expectations” are reading at a C level with “two to five lines of text on each page” and the removal of finger tracking because “Eyes are taking over the process of matching the spoken word to the printed word.” (Fountas & Pinnell, 2015). Yet, the teaching of component skills is limited or altogether lacking in preschool and early kindergarten.
Early childhood educators and policy makers often discuss the skills very young children should possess (Neumann et al., 2000; Copple & Bredekamp, 2009; Dodge, Colker & Heroman, 2002; NYS Education Department, 2016; Meisels, Marsden, Jablon, & Dichtelmiller, 2013) but procedures for specifically teaching these emergent skills appears to be deficient.

The National Early Literacy Panel (2008) and the National Reading Panel (2000) both provide strong evidence from their meta-analyses that instruction in phoneme segmentation in preschool is highly effective, yet it is rarely utilized or condoned by early childhood curricula and program evaluators. Children who possess skills in alphabet knowledge, phonological awareness, rapid automatic naming, name writing and phonological memory before the start of kindergarten are likely to exhibit later success in reading (National Early Literacy Panel, 2008). Most preschool curricula, however, continue to maintain that young children are not developmentally ready for instruction in phonemic segmentation or phonemic awareness and recommend only simple exposure to rhyming and brief discussions of some new vocabulary words (Dodge et al., 2002; Epstein et al., 2002; NYS Education Department, 2016). Many early educators and curriculum evaluators even discourage the identification of letter names and individual sounds in a systematic way.

*The Creative Curriculum* (Dodge et al., 2002) is standard in NYC Child Care/Head Start and NYC Universal Prekindergarten programs. While the authors of the curriculum appropriately define phonological awareness, phonemic awareness and phonics, they state, “The preschool teacher’s role in promoting phonological awareness is to draw children’s attention to the separate sounds of spoken language through playful songs, games, and rhymes.” (p. 126). No discussion of letter names, sounds, incorporating phoneme segmentation and blending activities is suggested. Often, the teaching of these component skills are delayed until kindergarten or first
grade, or not utilized at all (Yeh & Connell, 2008). Other widely used curriculum (High/Scope, Engage NY for Pre-K) also do not teach letter–sound relationships or phoneme segmentation and blending explicitly. Authors of the High/Scope curriculum state “Rather than have young children rote memorize letter names and sounds, teachers in High/Scope programs build phonemic awareness through everyday play and games as children sing songs, hear and tell stories, make up nonsense words, invent and repeat rhymes, or move to rhythmic chants” (Epstein, et al., 2002; Yeh & Connell, 2008).

Goswami (1990) found that rhyming ability predicted future reading ability and then hypothesized that rhyme may be a developmental precursor of phonemic awareness. Bryant, MacLean, Bradley and Crossland (1989) also suggested a strong developmental connection between rhyme and reading that has little to do with understanding single phonemes. Many early childhood advocates and preschool curricula developers base their ideas on this research evidence from many years ago and maintain that only rhyming and oral vocabulary activities are developmentally appropriate for children (Neumann et al., 2000). However, Johnston, Anderson and Holligan (1996) found that rhyming practice explained no unique variance in reading skill in a study of four and five year olds once vocabulary and letter knowledge were accounted for.

Currently, New York City Department of Education Universal Prekindergarten (NYC UPK) Performance Standards (2003) for Language and Literacy state, “To facilitate children’s later ability to learn to read and write, the instructional program, as proven by research, must promote: alphabetic knowledge; phonological awareness; book and print concepts; vocabulary knowledge; and discourse skills - meaningful conversations with their peers and with adults” (p. 27). For English language learners they also suggest, “Providing opportunities for children to sing or respond to predictable or rhyming books” (p. 27). When the standards are reiterated with
Performance indicators later in the text, they state that in order to develop phonemic awareness a child should “manipulate language in a playful manner...identify sounds in spoken language, begin to recognize rhyming words in context such as in finger plays, songs and literature and to orally experiment with rhyming words” (p.33). Most early childhood educators follow these suggestions and recommend training in phonological awareness without the specific introduction of letters or individual phonemes, but by playing rhyming games and songs (Copple & Bredekamp, 2009).

However, these NYC UPK standards also suggest that by the end of the school year children should be able to “recognize the print-sound connection, experiment with shapes and sounds of letters, match names and identify personally significant letters of the alphabet by spontaneously making some letter sound matches that are important to him/her” (NYC Department of Education, 2003, p.33). Unfortunately, there is nothing included in the standards or in several widely used and recommended curricula that address the teaching or appropriate introduction of alphabet knowledge, how the children should come to possess phonemic awareness, how they may be able to recognize the print-sound connection, or spontaneously make letter sound matches.

Teachers are asked to assess their students through a work sampling system on reading and phonemic awareness. The Work Sampling System, 5th Edition® (Meisels, Marsden, Jablon, & Dichtelmiller, 2013) includes a section on scoring and reporting that give teachers some guidelines for assessing children’s abilities. This section states that summary reports can replace conventional report cards as a way of recording progress and communicating with parents. Scores are “As Expected” or “Needs Development.” Standards-based Developmental Guidelines Performance Indicators result in scores of “Not Yet,” “In Progress,” or “Proficient.”
The resources section of The Work Sampling System® includes The Language and Literacy Research Summary relating strong evidence-based information on each component to be sampled and a breakdown of the approximate grade level when children typically accomplish these abilities. This summary mainly includes the research-based recommendations of the National Early Literacy Panel (NELP, 2008), contrasted with information from the National Association for the Education of Young Children’s (NAEYC) Position Statement (Copple and Bredekamp, 2009).

The research supporting the assessment of reading confirms the importance of alphabetic skills (knowledge of letter names and sounds) for the development of reading and that children who are proficient in identifying letters (naming upper and lowercase letters, recognizing beginning and ending word sounds) at entry into kindergarten show stronger skills at the end of kindergarten and in first grade on measures of phonological processing and word reading compared to children who are not proficient. (Denton & West, 2002; West, Denton & Germino Hausken, 2000). They also cite the NELP’s meta-analysis of the strong relationship between the emergent literacy skills in the preschool period and reading skills at school age, stating that alphabetic skills are strong predictors of decoding, comprehension and spelling in English and non-English speaking populations. It then states that the proportion of young children able to demonstrate cognitive and early literacy skills such as alphabetic knowledge has increased between 1993 and 2007 estimating that 32% of preschoolers are able to recognize all 26 letters of the alphabet. They cite the National Association for the Education of Young Children’s (NAEYC) 2009 position statement explaining that from ages three to four, most preschoolers are able to identify some letters and make some letter sound matches, and by age five most
kindergarteners are able to recognize and name letters without much effort (Copple & Bredekamp (2009).

The research supporting the assessment of phonological awareness stated in the Language and Literacy Research Summary correctly defines phonological awareness, phonemic awareness and phonics, pointing out the correlation between phonemic awareness skills and word reading skills. The authors cite the NAEYC position statement again, explaining that for preschoolers, phonological awareness is not automatically acquired, but should be encouraged individually through rhyming games, alliteration, songs, finger plays, and clapping out syllables to words.

However, the connection from phonological awareness to phonemic awareness is not explicitly stated, rather the summary moves to discuss kindergartners, saying that teachers can help develop an awareness of the smallest meaning units (phonemes) that make up a spoken word. Kindergartners that know their letters and have begun to connect some letters with sounds, by the end of kindergarten, should be able to recognize some very common words by sight (Copple & Bredekamp, 2009). Again, there appears to be no discussion as to how teachers should instruct students in acquiring phonemic awareness or connecting speech to print.

The Work Sampling System® (2013) as well as supporting evidence from the NELP and the NAEYC’s (2009) position statement clearly identify the skills preschool and early kindergarten children should possess in order to become strong readers. They give teachers some guidelines on how to score and report progress. They make strong suggestions that teachers “help develop”, “support”, and “provide assistance” to individual children in order to scaffold young children to reach proficient levels of reading. However, many teachers have difficulty reading research based reports and relating assessment data to practice. Many struggle to
appropriately define and assess phonemic awareness, and have difficulty developing and carrying out activities that promote it (Moats, 2000). Teacher inhibitions about the developmental appropriateness of directly instructing students in letter-sound relationships may lead to ineffective instruction or no instruction in this area (Yeh & Connell, 2008).

**Common Core Standards for Pre-Kindergarten**

With the adoption of Common Core Standards for school aged children, New York State has developed aligned standards for prekindergarten as well. The NYS Pre-Kindergarten Common Core Standards (2011) appear more rigorous than the NYC UPK recommendations. The Common Core standards state that prekindergarten students should be able to “Recognize and name some upper/lowercase letters of the alphabet, especially those in own name” (p. 20). Later in the text, they state that students should “Demonstrate awareness of relationship between sounds and letters, isolate and pronounce the initial sounds in words (and) Demonstrate emergent phonics and word analysis skills. With prompting and support (pre-kindergarten students should) demonstrate one-to-one letter-sound correspondence by producing the primary sound of some consonants” (pp. 21-22). However, there are no recommendations of how a child might gain such skills in the prekindergarten year, or what appropriate teaching methods or curricula may entail. The Common Core Standards suggest naming “some” letters, especially those in the child’s name, but then state that children should be able to isolate and pronounce the initial sounds in words and demonstrate emergent phonics and word analysis skills. The concept of emergent phonics goes beyond the typical preschool suggestions for phonological or phonemic awareness. Phonics calls for specific connections to be made between the graphemes (letters) and phonemes (sounds) in spoken language. These requirements and skills seem disconnected from the most commonly used curricula that call for practice in songs, games, and rhymes and only
incidental exposure to letters through reading stories aloud. There is no recommendation of a clear pathway for the teaching, learning or understanding of grapheme-phoneme connections that contribute to later reading success.

EngageNY, a free curriculum provided by the NYS Department of Education includes charts that specifically show which lessons address each Common Core Standard developed for NYS prekindergartners. However, there is only one lesson, Thumbelina, in the Classic Tales Reading Curriculum that receives any check marks for standards relating to the phonological awareness. In the Word Work/ Extensions section of Thumbelina teachers are asked to have children blend two spoken syllables saying a whole word and to clap the four syllables of Thumbelina. They are also asked to encourage students to write their own names using uppercase and lowercase letters (NYS Education Department, 2016).

Since October of 2012, less than two months into the school year, many kindergarten students at New York City Public Schools were given several Informational Reading and Writing Assessments where they were expected to ask and answer questions about key details after listening to and following along with several short science texts about plants. The assessment states: “Students will, with prompting and support, ask and answer questions about key details in a text. Students will actively engage in group reading activities with purpose and understanding. Students will use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.” (Teachers College Reading and Writing Project Common Core Aligned Performance Assessments, 2013-2014, p.1). In order to receive a rating of “effective” on the rubric, kindergarten children must have “writing that shows directionality and a sense of word, with letters generally representing each dominant sound in a word and spaces between
many of the words.” Kindergartners should also “point to words as he or she reads, demonstrating a grasp of one-to-one correspondence” (Teachers College Reading and Writing Project Kindergarten Informational Reading/Writing Performance Assessment Rubric, October 2012-2013).

Tunmer, Chapman and Prochnow (2006) also experimentally studied reading-related variables at school entry strongly linked to activities in the home environment that help to encourage early literacy development. They term these prerequisite reading related variables literate cultural capital. Students in New Zealand are taught to read through a constructivist, whole language approach, with little emphasis placed on word level skills like phonemic awareness and decoding and little effective assistance for students who begin to struggle with reading. They hypothesized Matthew effects based on socio-economic factors strongly related to the home literacy environment. Results of a hierarchical analysis of seven years of longitudinal data revealed the skills and abilities demonstrated at entry to the first year of schooling accounted for nearly 70% of the variance in achievement of 7th year students in New Zealand, with literate cultural capital accounting for almost 50% of the variance. Differences in literacy-related skills, knowledge and experience can quickly become highly problematic if not adequately addressed by educators at the early stages of learning (Tunmer, Chapman & Prochnow, 2006).

Clearly, there is a remarkable gap between the standards and instruction suggested for prekindergarten level achievement and expectations for effective performance in early kindergarten less than four months later, including a summer break with likely little or no formal instruction. It seems unfair to expect kindergartners to attain such high standards without first giving them the tools and foundational knowledge to meet the challenge within their own
educational public school prekindergarten. In the current study we hope to show that evidence-based, simple, integrative phonemic awareness activities are not only developmentally appropriate and enjoyable for prekindergarten students, but that the knowledge and skills gained from these activities encourages children to make further orthographic connections for vocabulary learning and will result in improved progress in kindergarten and beyond.

**Phases of Development in Learning to Read Words**

Ehri (1998) explains that there are three graphophonemic capabilities that enable children to begin to secure the complete spelling of a word in memory: knowledge of letter shapes, knowledge of how graphemes typically symbolize phonemes in words and phonemic segmentation skill. Instruction is necessary to assist children in acquiring letter name knowledge, phonemic awareness and phonemic segmentation skill. As children begin the process of learning to read, different relations between these skills predominate and help to link written forms of words to their pronunciations and meanings in memory. Ehri describes these relations in four phases of development of sight word learning: pre-alphabetic, partial alphabetic, full alphabetic and consolidated alphabetic (Ehri, 1998).

During the first phase of reading, or the pre-alphabetic phase, children read sight words by forming connections between salient cues or attributes and the overall meaning or pronunciation of the word. Letter-sound (or grapheme-phoneme) relationships are not utilized in this phase of reading. Connections are formed between the visual cues and the meanings of words, such as the two round eyes in ‘look’ or two bedposts in the word ‘bed.’ As children gain knowledge of letters they enter into the partial alphabetic phase. In this phase, some connections are made between recognized letters and sounds they represent in the pronunciation of the word. Children begin to connect and segment these salient sounds, especially those represented in the
names of the letters (e.g., ‘ess’ for S and ‘tee’ for T.) However, readers in this phase still do not have full alphabetic knowledge of all the letters and the sounds they represent, and do not know how to fully segment speech into phonemes that link to graphemes. This knowledge becomes solidified with complete connections between letters and phonemes in the subsequent full alphabetic phase. Finally, in the consolidated alphabetic phase, more and more words are retained in memory and letter patterns that recur in words become consolidated so that most words can now be read by sight (Ehri, 1998).

In the current study, we utilized children in the partial alphabetic phase of sight word reading. Prekindergartners and early kindergarteners who recognize a majority of letters by name, but were not yet fully connecting the phonemes in spoken language to letters (graphemes) received phonemic awareness training in order to subsequently explore the contribution of orthography to memory and word learning.

**Letter Name Knowledge**

Researchers and educators are divided in whether they have questioned or supported the teaching of letter names, shapes and sounds to very young children before the formal onset of reading instruction. Adams (1990) explained that utilizing letter names and graphemes facilitates learning because they provide visible concrete representations of phonemes, which are transient and disappear as soon as they are spoken or heard. In order to recognize the graphophonemic connections in a word, children must first process an ordered array of individual letters that comprise it. Learning a new symbol (letter) for a sound is thought to enhance the learner’s ability to think and results in a relationship between phonological awareness, phonemic awareness, alphabetic literacy and memory (Adams, 1990). Share (2004) also asserts that knowing the names of letters may help young children understand that writing represents spoken language.
Letter name knowledge assists in letter-sound learning and may have a bearing on how children use letters and sounds to improve their memory of newly presented words and concepts.

However, many early childhood educators believe that prekindergarten children are not developmentally ready to process letter names, shapes or sounds and that the direct teaching of these skills may be harmful to the reading process. Rather than have young children rote memorize letter names and sounds, it is suggested that teachers build phonemic awareness through everyday play and games as children sing songs, hear and tell stories, make up nonsense words, invent and repeat rhymes, or move to rhythmic chants (Dodge et al., 2002; Epstein, et al, 2002; NYS Education Department, 2016).

Share and Gur (1999) investigated four and five year old children’s ability to attend to print under various circumstances. They showed Israeli children logographic images, such as advertisements for McDonald’s or Pepsi, both with and without the accompanying logo and colors. They also utilized preschooler and kindergartner knowledge about their classmates’ names on individual storage lockers (cubbies) as are commonplace in most early childhood settings. Children were asked to identify names written on student cubbies, both in the context of the school and in isolation. Both four and five year olds could identify their classmates’ names on the cubbies when asked to do so in the context of the school that they were familiar with. However, only the older five-year-old children in kindergarten could identify the names presented in isolation without the familiar context of the school. Many were even capable of doing this with both final and initial letters covered in some trials. Share and Gur concluded that a majority of five year olds, but not four year olds were attending to print, rather than to contextual cues.
Blaiklock (2004) studied five-year-old children in New Zealand, currently being taught through a whole language approach. Positive correlations were found between phonological awareness and reading development, mediated by letter knowledge. He emphasized the role of letter knowledge when examining the relationship between phonological awareness and reading, explaining that the numerous significant correlations found between rhyme or phoneme awareness were reduced to nonsignificant levels after adjusting for differences in children’s letter knowledge. Letter name knowledge is known to be a strong predictor of reading and facilitates phonological awareness skills by helping children gain insights into the phonological structure of words (Blaiklock, 2004). The current study examined whether four and five-year-old children who knew the names of most alphabet letters utilized orthography to better learn and remember vocabulary words.

**Phonemic Segmentation Training**

The purpose of literacy instruction in school is to help children master the challenge of connecting their spoken language to the initially arbitrary symbols on a page. Disagreement has centered on when training should happen and whether the teaching of symbol-sound correspondences should be explicit or whether it should be meaning centered, with grapheme-phoneme correspondences taught incidentally in a whole-language context as the need arises (Ehri et al., 2001).

Oudeans (2003) considered two possible sequences for integrating and teaching letter-sound correspondences to kindergartners with limited phonological awareness. In a parallel non-integrated sequence children were taught the name and sound for each letter and were shown the written letter. Later in the same training session they were taught to segment and blend individually pronounced sequences of phonemes, but no explicit connection was made between
the two activities. The activities for letter-sound correspondences and the phonological awareness activities of blending and segmenting were taught within the same training session but separately. Conversely, within a parallel-integrated sequence the written letter, letter name and sound were all taught and immediately connected with blending and segmenting at the same time. The students were encouraged to move cards with letter labels as they segmented simple words, much like in the “say it and move it” sequence developed by Elkonin (Ehri & Roberts, 2006). Often, early childhood educators may feel that this much information given at the same time or connected so quickly may cognitively overwhelm young children. However, Oudeans (2003) found that the explicit connections made between letter sounds, phonological blending and segmenting in the parallel-integrated sequence helped the limited phonological awareness children to significantly improve their skills to be on par with typically functioning peers after only a ten-week intervention.

Yeh and Connell (2008) randomly assigned 128 preschool children from disadvantaged Head Start classrooms to three approaches in early literacy instruction. Students receiving instruction in phoneme segmentation, blending and letter sound relationships significantly outperformed students receiving only rhyming or vocabulary instruction on combined measures of phonemic awareness. Gains in the segmentation group were also greater than the rhyming and vocabulary groups in measures of letter-sound knowledge, with significant differences found between the phoneme segmentation and rhyming groups. In addition, neither rhyming nor vocabulary instruction groups significantly outperformed the phoneme segmentation group on combined measures of rhyming and vocabulary. The researchers concluded that “explicit instruction emphasizing phonemic awareness may be more likely to prevent reading difficulties, especially among disadvantaged children…than instruction emphasizing rhyming, vocabulary
development or incidental exposure to phonological activities in the context of story reading” (p. 254). Results suggested that instruction emphasizing phoneme segmentation is not only more likely to promote phoneme segmentation skill, but also more likely to promote future reading ability than rhyming or vocabulary activities, even for highly disadvantaged children as young as four years old.

Nation and Hulme (1997) also experimentally questioned the emphasis placed on rhyming skills as predictors of reading and spelling ability. They found onset-rime performance to be a poor predictor of future reading ability. Rather, they showed sound categorization and phonemic segmentation scores to be highly and significantly correlated with reading and spelling ability.

Boyer and Ehri (2011) found that segmentation training combining letters with articulation pictures was significantly superior to training with letters alone. The authors utilized phoneme segmentation training with three levels: A letter-only condition, a letter plus articulation condition and a no treatment control group. Both treatment conditions provided children with visible representations of phonemes as soon as words were spoken. Training in both experimental conditions involved using letters to spell phonemes in words. During the training process prekindergarten children manipulated letters, which may have helped to hold phonemic segments in memory. In the letter plus articulation condition children observed their own articulation, including the shape and position of the mouth, lips, tongue and teeth. Children were able to segment with letters and pictures of mouths articulating the appropriate phonemes. Physical awareness of articulation helped to improve phonemic awareness and subsequently improved reading and spelling achievement.
Results of their study showed that both types of segmentation training utilizing letters was more effective than no training in reading sight words and nonwords, and in segmenting and spelling words and nonwords. Additionally, segmentation training that included the articulation pictures along with the letters proved superior to letter training alone in sight word learning and nonword reading ability. Articulation pictures provided some advantage in learning to segment and spell words and phonemes compared to letters only, but the advantage decreased on posttests conducted seven days later. By using letters to teach segmentation, children were able to represent and manipulate concrete referents for phonemes that would otherwise disappear as soon as they are spoken. The letters enabled the children to hold phonemes in mind after the spoken sounds had disappeared, showing that even preschoolers can benefit from early training in segmentation and phonemic awareness (Boyer & Ehri, 2011).

Ouellette and Senechal (2008) taught three groups of early kindergartners 13 letter-sound associations. An invented-spelling group was encouraged to use the associations to spell target words phonetically and received corrective feedback once a week over a four-week period. A phonological awareness group was taught to match pictures of target words based on shared initial and final sounds and were also taught to segment words based on Elkonin’s say-it and move-it activity using only blank markers (Ehri & Roberts, 2006). They also received training and corrective feedback once a week for four weeks. A control group received the initial letter-sound training, hearing the target words as the other groups had, but were encouraged to draw pictures of the vocabulary words they heard.

Posttest measures included letter sounds, trained letter sounds, invented spelling, phonological awareness, awareness of double consonants, awareness of vowels and reading both practiced words and unpracticed words. The invented spelling group was the only group that was
taught to manipulate letters in relation to sounds. This group performed significantly better on measures of invented spelling and reading practice words and new words. However, the phonemic awareness group that used only blank markers to segment phonemes also outperformed the drawing-only group on posttest measures of letter sounds and inventive spelling. Segmenting the sounds of language, even without utilizing letters appeared to transfer to invented spelling ability. The authors explain that the results provide evidence that inventive spelling is an important tool in the acquisition of early literacy skills and as validation of the training procedures used.

The current study determined the effectiveness of phonemic awareness training by utilizing two conditions that provided explicit segmentation instruction with either letter tokens or shape tokens, and a no-segmentation rhyming control group where children listened to a rhyming story, discussed rhymes orally and had the opportunity to draw pictures.

**Orthographic Knowledge and Mnemonic Value for Vocabulary Learning**

When formal reading instruction begins, students already possess substantial linguistic competence with speech. The remaining issue is how to incorporate printed language into existing knowledge. According to Ehri’s identity amalgamation theory (1992, 2005), each word unit has several identities. Phonological identity represents how words are articulated and sound. Syntactic identities represent how words are used in sentences and semantic identity represents the meanings of words. All of these identities are present when young children acquire language. Orthographic identities, which are graphophonemic images, are not acquired until children begin the process of learning to read. Eventually, all of these identities are amalgamated or combined in lexical memory. Orthographic identities must merge with syntactic, semantic and phonological identities so that printed words and letters represent them as well.
Ehri and Wilce (1979) explored the beginning reader’s (first second grade) ability to use orthography as a representational system for facilitating memory for pseudowords, as well as how important such an ability might be in learning to read. The researchers proposed that orthographic knowledge would supply translation routines for converting print to a phonemic code, which could then be used to access words in the lexicon.

In a series of four experiments, first and second graders were taught four consonant-vowel-consonant (CVC) nonsense sounds in a paired associate sound learning task. Several types of study cues were paired with the nonsense oral responses. In the first experiment students saw either unrelated squiggles or the first letter representing the first sound of the nonsense word as a study cue. Among those seeing the first letter, two adjunct aids were added. Some students also saw the correct spelling for the CVC sound or they saw a misspelling of the nonsense response. Fifteen trials with feedback were provided to learn the words, and no cues or study aids were present at the time of posttests. Learning was assessed through several posttests of spelling production, sounding out and misspelling recognition. Results confirmed that sounds accompanied by adjunct spelling aids were learned significantly faster than sounds prompted by initial letters without spellings. Both were learned significantly better than squiggles or misspelled study aids, supporting the view that when children learn to read they acquire an orthographic mnemonic system which is activated spontaneously when word sounds are seen mapped in print.

In the second similar experiment, utilizing only first graders, the misspelled study aids were left out, so that children only saw squiggles, initial letters or initial letters with correct spelling aids. Several posttests were added including alphabet letter naming accuracy and speed, and phonemic segmentation ability. The authors predicted that orthographic mnemonic
capabilities distinguished more advanced from less advanced beginning readers. Again, learning occurred significantly faster when seeing spellings as study aids than when seeing initial letters or squiggles. Those learning the nonsense responses the quickest also showed superior performance in the phonemic segmentation task, especially when segmenting words with four phonemes. Results indicated that when children learn to read, they acquire an orthographic mnemonic system, which enables them to build up a repertoire of printed words in lexical memory.

The first two experiments suggested that spellings facilitate beginning readers’ memory for sounds, but the researchers wanted to rule out possible alternate explanations that may have allowed the students to recall the words better when seeing spellings than with other cues. The squiggles and initial letters were no longer used as test cues and only the numbers 1-4 were used to prompt the recall of the responses. In three conditions either a spelling was shown, the experimenter articulated the phonemic segments separately, or the students repeated the nonsense sound an additional time during each study trial. Results showed that recall in the spelling condition was again significantly better than with all other aids. Researchers interpreted the results to suggest that spellings facilitate sound memory by prompting learners to form orthographic images of the sounds and store these in memory. However, the image forming process was only implied since children were only shown spellings and not asked directly to form images. In order to specifically demonstrate this effect, participants in the fourth experiment listened to oral spellings and imagined what they would look like or they rehearsed the sounds several times. Recall of sounds was significantly better even when children simply imagined the spellings than when they repeated sounds.
The combination of the four related experiments showed that alphabet letters provide a visual code for representing and storing sounds of words in lexical memory. Researchers found support that orthography has mnemonic value among beginning readers and that the visual-phonological property of spellings is central to that effect. Exposure to spellings made it easier for first and second graders to store and remember the pronunciations of pseudowords (Ehri & Wilce, 1979).

Scott and Ehri (1990) taught pre-reading preschoolers and kindergartners six words with either simplified phonetic spellings or logographic, visually distinctive spellings. Word reading practice included either naming or counting letters in phonetic spellings or counting letters in visual spellings. Results showed that phonetic spellings were learned better than visual spellings regardless of whether letters were named or counted. The knowledge of letter names or sounds is sufficient to enable pre-readers to begin to read words using phonetic cues. In addition, performance when naming letters was not superior to performance when simply counting letters, indicating it is not necessary to direct attention to the letter names in order for children to use orthographic information.

In *The Mnemonic Value for Orthography for Vocabulary Learning* study conducted by Rosenthal and Ehri (2008), they found that spellings activated graphophonemic connections to better secure pronunciations and meanings of new vocabulary words in memory. Second graders who saw the spellings of words were better able to make connections that helped to secure pronunciations and meanings of those words in memory. According to Ehri’s (2005) connectionist view of sight word learning, remembering how to read words over trials involves securing graphemes in spellings to phonemes in pronunciations and storing these connections along with meanings in memory so that subsequently the sight of the words activates the
graphophonemic connections leading to the word in lexical memory. In other words, seeing words in written form helped children learn and remember the pronunciations and meanings of those words better than if they only heard the words spoken.

Second and fifth graders learned and remembered the pronunciations and meanings of new vocabulary words better when they were exposed to written forms of the words during their study trials than when they only heard and repeated the words (Rosenthal & Ehri, 2008). Evidence of this improvement was shown by fewer word learning trials needed to reach criterion, as well as better memory on the delayed posttests. Improvements were also not limited to one developmental level, because the results were consistent in both the second and fifth grades. Higher level fifth graders with more orthographic knowledge benefitted even more from the spellings, and made successively greater gains in each trial than did lower level readers.

Ricketts, Bishop and Nation (2009) also explored how orthography facilitates vocabulary learning. Two aspects of vocabulary learning were explored: the learning of links between phonology and meaning (semantic learning), and the learning of orthographic patterns (orthographic learning). Eight and nine year olds were taught 12 nonwords in a paired associate learning task. Children learned novel names of interesting objects orally. The objects were represented in photographs. Six objects included an orthographic representation of the novel name for the object (a written word), and six objects had no label present.

First, each word was presented orally and children were given practice in pronouncing the words correctly. Then six training trials including three alternating repetition sessions and three production sessions followed. In a repetition session, children saw each picture, then heard the nonword. Orthography was also shown for six of the twelve pictures in each session. No attention was drawn to the presence of the letters and children were not instructed to use it in any
way. Children were asked to repeat the word orally and given corrective feedback for any errors in pronunciation. In the following production session, children were shown the picture and asked to say the word associated with it. Orthography was not presented with any picture. After attempting to say the correct word, the children heard the paired word and were asked to pronounce it. Two more repetition sessions followed, alternating with two more production sessions.

Semantic learning was assessed with a nonword-picture matching task and orthographic learning was assessed utilizing a spelling task. In the nonword-picture matching task students had to select the correct picture from a grid of four pictures of the trained objects. For the spelling task, children were asked to write spellings of the nonwords trained. Children were also assessed prior to the experiment utilizing standardized measures for nonverbal reasoning, vocabulary and reading skills. Results showed that children were more able to produce target spelling patterns for items that had been trained with orthography, and that the presence of orthography facilitated learning for semantic pairings as well. By the end of the training sessions, students learned nonwords significantly better when orthography was present. The authors assert that learning is improved for word representations that include phonological, semantic, and orthographic information. They also cite Rosenthal and Ehri’s (2008) study, which was published as their study was being conducted. They confirmed that the presence of orthography facilitates oral vocabulary acquisition in second grade children.

Similarly, Ricketts, Bishop, Pimperton & Nation (2011) explored how seven and eight year old children learned the meanings (semantic) and spelling patterns (orthography) of novel words encountered in a story context. Previously, research has indicated that orthographic
learning depends on phonological decoding skill, while semantic learning is more closely associated with reading comprehension and oral vocabulary knowledge.

In this study, children were exposed to eight nonwords embedded in story contexts. Each story repeated the nonword four times and context was manipulated such that half of the stories provided specific cues to the meaning of the nonword (specific condition) and half provided ambiguous cues (general condition). After reading each story, three posttests were given: orthographic choice and spelling to assess orthographic learning, and nonword-picture matching to assess semantic learning. Spelling tests contained homophone distractors to see if the students would be able to pick the spelling shown in the story reading. They found that decoding (indicating that self-teaching via phonological recoding) was the strongest predictor of orthographic learning, and semantic learning was predicted most strongly by existing levels of orthographic knowledge and vocabulary knowledge.

Chambre, Ehri and Ness (in press) studied orthographic facilitation in beginning readers and whether directing attention to print enhanced the effect. First graders studied two sets of novel spoken words paired with pictures and spoken definitions. One set was paired with spellings and one set was paired with no spellings. Six and seven year old students learned the pronunciations of words significantly better when spellings were seen, and the benefit was still evident two weeks later. Memory for the meanings of words, however, was not improved by spelling exposure, nor was it improved by researchers drawing students’ attention to print.

Orthography has been found to facilitate vocabulary word learning in a variety of distinct populations spanning age and ability. Participants with Autism Spectrum Disorders (Lucas & Norbury, 2013; Ricketts, Dockrell, Patel, Charman, & Lindsay, 2015), Down’s Syndrome (Mengoni, Nash, & Hulme, 2013), English language learners and bilingual students (Jubenville,
Sénéchal, & Malette, 2014; Miles, Ehri, & Lauterbach, 2016; Vadasy & Sanders, 2015), and students with specific language impairments (Ricketts et al., 2015) have all experienced improved vocabulary learning from seeing spellings of words.

Evidence is clear that children in the full and consolidated alphabetic phases show improved learning and memory when orthography is present. With the current expectation that kindergartners will be able to read and write within their first semester of school, more research with younger students is needed to ascertain whether beginning readers in earlier alphabetic phases benefit from seeing letters and spellings or whether this extra information may overwhelm their ability to develop phonological and phonemic awareness. In the current study partial-alphabetic phase readers were taught to segment words in one of three conditions and then completed two vocabulary learning tasks, one task showing spellings symbolizing phonemes in the words being learned and one task showing unrelated number labels. It was expected that recognizing letters and connecting letters to sounds would provide a pathway to help even partial alphabetic phase readers begin to make orthographic connections that can secure the pronunciations and meanings of written words in memory.
Pilot Study, Rationale and Hypotheses

Pilot Study

A pilot study was conducted to explore prekindergarten students’ letter name knowledge, phonemic awareness and mnemonic value for orthography in an experimental, counterbalanced design. Twenty-two participants from childcare centers at two public colleges were pretested on alphabet knowledge, numeral name knowledge, non-word decoding and the Peabody Picture Vocabulary Test-4 (PPVT-4, Dunn & Dunn, 2007).

Several pretests were utilized to identify students in the partial alphabetic phase of reading. Letter name knowledge, numeral name knowledge and non word decoding were assessed. It was expected that partial alphabetic phase readers would likely have difficulty decoding any of the words on the list. The Peabody Picture Vocabulary Test-4, Form A (PPVT-4; Dunn & Dunn, 2007) was also administered to assess the students’ receptive vocabulary.

Pretests revealed that children in the pilot study were solidly in the partial alphabetic phase of reading development. Students were well versed in letter name knowledge ($M = 24.86$, $SD = 2.21$) and numeral name knowledge ($M = 8.55$, $SD = .912$). Vocabulary performance on the PPVT-4 was representative of national norms with a mean score of 105.23 ($SD = 15.122$). Overall, the results of the pretests indicated that, on average, the prekindergartners utilized in this study were functioning at a slightly higher level than what might be expected for children of this age.

All qualifying participants were introduced to a phonemic segmentation task called “Mrs. Magic Mouth” (Ball & Blachman, 1991; Uhry & Ehri, 1999). Students were matched based on pretest results and randomly assigned to one of two conditions. A letter condition used
small square markers labeled with letters corresponding to the phonemes to segment CV words spoken by the experimenter. Students in the number/symbol condition used the same markers labeled with numbers and symbols from a typical keyboard. These numbers and symbols clearly did not correspond to the sounds in the words spoken and were simply utilized as markers to separate phonemes in the spoken words.

Following phonemic segmentation training all students were introduced to two sets of five drawings. Set One consisted of five uniquely drawn animals on separate pages and Set Two consisted of five different faces. All of the drawings had distinguishing characteristics and were given simple CV names pronounced orally by the experimenter. All participants were shown each drawing in the set individually and told about the distinguishing characteristics. Each set was accompanied by either a CV letter pair corresponding to the sounds in the name (e.g., LU for Lu, PO for Po) or a 2-digit number pair that remained constant each time the drawing was shown (e.g., 18 for Lu, 28 for Po). Each child experienced a set of drawings labeled by numbers and a set of drawings labeled by letters in a counterbalanced design. No attention was called to either of the accompanying letter or number labels.

After the initial introduction to a set of five drawings, labels, and the verbal introduction of new names and characteristics, children were asked to try to remember the names of the drawings. Participants were given up to 20 learning trials with corrective feedback to reach a criterion of all drawings named correctly for two successive trials. One day after reaching criterion on each of the vocabulary learning trials, students were post-tested on three measures. Students were shown the drawings without accompanying labels and asked to remember their names, students were asked to say the name given to the drawing when seeing only the accompanying label and students were asked to remember the distinguishing characteristics of
the animal or face. The number of vocabulary learning trials needed to reach a criterion of all five names remembered in two consecutive trials was also utilized as a dependent measure.

In analyzing the results of the data we utilized a mixed analysis of variance (ANOVA) with type of segmentation token (letters vs. symbols/numbers) as the between subjects independent variable and the type of label (letters vs. numbers) as the repeated measure independent variable. The dependent measure was the number of trials needed to reach criterion in the vocabulary learning tasks. There was no significant main effect for label or segmentation training and no interaction of label with segmentation training. While there were no significant results for segmentation training, several tests did reveal moderate to large effect sizes, indicating that significant differences might have been detected with more participants in each condition. Most notably, children taught to segment with letter tokens needed fewer trials to reach criterion ($d = 0.88$) and recalled more names ($d = 0.75$) when seeing letter labels in the vocabulary learning task.

When comparing vocabulary learning from trial to trial we found significant growth each trial, as expected, but there were no significant main effects or interactions between the independent variables. The interaction of print label, segmentation token training and trial approached, but did not reach, significance. Although results did not attain significance, students receiving segmentation training with letter tokens remembered more names by the tenth trial than those with number/symbol segmentation token training. Likewise, students seeing letter labels in the vocabulary learning task remembered more names than those seeing number labels, on average.

We also compared posttest results as a function of the print label (spellings vs. numbers) that accompanied drawings in the word learning task and segmentation token (letters vs. numbers)
numbers) that were used to teach segmentation. Three posttests were completed the day after each student reached criterion in learning the names of each set of drawings. The posttest measures included the number of names that children remembered when seeing the drawings only, the number of names remembered when seeing the labels only, and the number of characteristics remembered when hearing the name of the drawing spoken. There was no main effect for segmentation token in any of the analyses and no interaction between segmentation token and print label on any of the dependent measures. However, the number of names remembered in response to drawings that had been seen with letter labels ($M = 4.59, SD = 0.73$) was higher than names remembered with the number labels ($M = 3.95, SD = 1.17$) by a significant margin $F(1, 20) = 5.21, p = .033$. The number of names remembered in response to the print labels also favored the letter labels ($M = 3.68, SD = 1.76$) over the number labels ($M = .95, SD = 1.21$) by a highly significant margin, $F(1,20) = 35.714, p < .0001$. The number of characteristics recalled did not differ significantly between letter ($M = 7.46, SD = 2.65$) and number labels ($M = 7.11, SD = 2.04$), $F(1.20) = .177, p > .05$.

Finally, Pearson correlation coefficients were calculated to examine the relationship between PPVT-4 standardized scores and posttest measures. It has been suggested that students with higher vocabularies are more successful in deriving the meaning of unknown words in texts and that building a strong early vocabulary through shared reading will serve as the foundation for learning how to read (Cunningham, 2005). Significant correlations were only found between vocabulary and two posttest measures. Children with higher vocabulary scores needed fewer trials to learn new names in the letter label condition, and they could recall more names when seeing the accompanying letter labels. This may also be attributed to a generally higher cognitive
level among students with higher vocabularies, as there was little correlation between vocabulary score and other posttest measures.

Based on the results of the pilot study it is clear that when students saw spellings, rather than number labels, they remembered more new words in posttests the following day. Also, when seeing the spellings of words alone, children were much more capable of linking letters to the name of the drawing than when they saw number labels. Almost every child could recall more names of drawings when seeing the letter labels than when seeing number labels. This showed that children were using their knowledge of letter-sound relations to form connections between letter labels and pronunciations of names to remember them.

While segmentation training with letter tokens did not show any advantage over segmentation training with symbol/number tokens on any of the dependent measures, it was evident that phonemic segmentation training was an appropriate skill to teach prekindergartners who knew the names of alphabet letters. Every child understood the concept of separating the sounds into boxes and enjoyed the game as it was presented. Segmentation training with letters approached significance and produced large effect sizes for the number of word learning trials needed to reach criterion and the number of characteristics remembered when hearing names spoken.

**Rationale**

Ehri and Wilce (1979) found that spellings function as a mnemonic device, enabling first and second grade readers to retain pronunciations of nonwords in the memory. Orthography has mnemonic value among beginning readers, and sounds were learned faster when spelling aids were seen during study periods. Beginning readers who benefitted most from the spellings of words also showed enhanced reading ability (Ricketts, Bishop, Pimperton & Nation, 2011;
Chambre, Ehri & Ness, in press). Rosenthal and Ehri (2008) and Ricketts, Bishop and Nation (2009) also found that second graders learned and remembered new words better when they were exposed to spellings of the words than when they only heard the words spoken. If spellings have mnemonic value for children in first and second grades, we suggest that it may also be beneficial for prekindergarten and early kindergarten students to begin to form connections between letters and the sounds they make, and may allow partial alphabetic phase readers to better learn and remember new words.

Various studies have suggested that children who enter kindergarten with the ability to segment words into sounds and to identify the names or sounds of letters progress faster than children who do not possess this knowledge (Denton & West, 2002; West, Denton & Hausken, 2000; National Early Literacy Panel, 2008). In addition, children who are taught simple segmentation skills when first starting to read also make better progress (Ehri, Nunes, Willows, Schuster, Yaghoub-Zabeh, & Shanahan, 2001, Tunmer et al., 2006). Including appropriate, integrative and enjoyable instruction in alphabet name knowledge, as well as phonemic awareness and segmentation training in preschools seems essential to allow children to meet the expectations of today’s kindergarten assessments and Common Core Standards.

Currently, many preschool educators are not providing children with the skills and knowledge needed to succeed with the ever-increasing reading expectations in kindergarten. Even publicly funded preschools under the same education departments as kindergarten and primary grades are not providing learning opportunities that allow all students to meet the expectations soon to be assessed. Parents who entrust their child’s education to public facilities in prekindergarten, thinking they will be prepared for kindergarten are being underserved. Only families that understand the heightened expectations and can provide extra activities for their
children are truly preparing them for kindergarten expectations. Instead of providing a fair and equal opportunity for all children, this only serves to perpetuate the gap between socioeconomic status and parental education levels (Tunmer et al., 2006). In this study we hope to show that four and five year old children benefit from knowing the names of letters and that phonemic awareness training that includes segmenting sounds is a developmentally appropriate and enjoyable skill for very young children to learn. Furthermore, we expect to demonstrate that the mnemonic value found in orthography will aid children in the partial alphabetic phase to better learn and remember new vocabulary words.

**Hypotheses**

The purpose of this study was to explore whether preschool and early kindergarten children will be able to use letter name knowledge and phoneme awareness training to learn and remember the pronunciations of new words better when supported by simple spellings of the words than when exposed to another type of control symbol, such as numbers.

Our first research question examined whether children in preschool and early kindergarten who are taught how to segment words with letter tokens outperform those trained with shape tokens and those who receive no segmentation training on learning and posttest measures. We hypothesized that students receiving phonemic segmentation training with letters would learn and remember new vocabulary words significantly better when they view letter labels during study trials but not test trials and would need fewer learning trials to reach criterion than students in the other conditions. We also expected that children in both phonemic segmentation conditions would outperform children who received no segmentation training.

Our second research question examined whether preschool and early kindergarten students would learn vocabulary words in fewer trials, remember the names and features better,
and recognize names corresponding to spellings better when they were exposed to spellings of
the words during study periods than when not exposed to spellings. We expected that when
students viewed spellings, they would better remember the names of drawings and learn the
names in fewer trials than when they were exposed to spellings. We expected to show that even
partial-alphabetic phase children who are taught how to segment with letters and attend to sounds
in simple words would utilize this skill to learn and remember new words significantly better
than those who are not taught.

Finally, positive findings would be interpreted to indicate that alphabetic knowledge and
phonemic segmentation training are appropriate and essential skills to be taught in preschool and
can lead to better progress when learning to read. Results of phonemic awareness training would
likely show that four and five year olds are capable of understanding instruction in letter sound
correspondences and can utilize this instruction and knowledge of letter names to begin the
process of connecting symbols and sounds to enhance learning and memory. We expected to
show that instruction in letters and sounds is not only necessary, but can also be interesting, fun
and integrative for partial alphabetic phase children.
Chapter 4

Method

Participants

Participants were 60 children selected from participating preschools and kindergartens in New York City. Socioeconomic and ethnic diversity was widely represented. Twenty-seven children were students from private preschools located in high socioeconomic areas. Twenty children attended child care centers for reduced tuition that served parents at a large public university, while 13 students were early kindergartners attending a charter school in district 7 of the South Bronx, where 92.3% of families with school aged children live below the poverty line (Demographic Snapshot (2016), NYC Department of Education).

The public university child care centers were created to provide low cost early childhood learning services for preschool aged children of undergraduate and graduate students. An additional reduction in the cost of childcare is given to students based on income, with some families paying as little as five dollars per week for full day care. While the specific income information is not available for the children and families participating in this study, 53.3% of students at senior colleges and 66.1% of students at community colleges received some type of financial aid in 2015. In addition, 32.3% of students at senior colleges and 48.8% of students at community colleges had household incomes of less than $20,000 per year (Office of Institutional Research, http://www2.cuny.edu/about/administration/offices/oira/institutional/).

The Creative Curriculum (Dodge et al., 2002) was utilized at the public university sites. The private preschools did not identify any specific curricula. Rather directors and teachers stated the curriculum as “play-based” or “student centered.” The charter school kindergarten demonstrated a variety of whole language based learning strategies for English Language Arts,
including flashcards for sight words and unison reading in groups. While the researcher did witness some incidental instruction of letter names at two of the university based preschools there was no instruction or activity related to phonemic awareness, segmentation or grapheme-phoneme correspondences in any of the classrooms.

The mean age of participants was 58.53 months ($SD = 5.13$). The mean age for girls was 58.61 months ($SD = 4.67$) and for boys was 58.41 months ($SD = 5.93$). Students ranged from 48 months to 73 months; girls from 48 to 67 months and boys from 50 to 73 months. All of the children were at least four years of age and had proficient use of English.

Participants were pretested on letter names, number names, vocabulary, word reading and non-word decoding ability to establish them as partial alphabetic phase readers. Several criteria were applied to qualify children as partial phase readers for participation in the study. Children had to identify at least 15 letters that were used in the study and had to recognize at least six numbers. Children could not decode more than three nonwords; otherwise they were considered beyond the partial alphabetic phase. A total of 98 children received parental permission to participate in the study. Fourteen children did not qualify for the study because they did not have sufficient letter name knowledge. Five children were dropped because they were capable of fully decoding more than three non-words and not considered partial alphabetic phase readers. Nineteen students who received parental permission and qualified as partial alphabetic phase readers were dropped before completing all components of the study. Eleven children were dropped because of lack of attendance, which did not allow them to complete posttests the day after training, and eight children who qualified showed a lack of desire and did not give daily verbal assent to the researcher.
Pretests

Several pretests were administered individually to children in the following order during the first session. (See Appendix A and Appendix B for the Data Collection Sheet and Scripts.)

Letter identification. Children were shown all 26 upper case letters one at a time. Letters were printed on index cards and presented in a random order that remained consistent across children tested. The children were asked to name each letter orally. No feedback was given for incorrect answers. In order to continue in the study children needed to name at least 15 letters, specifically the letters to be used later in the study (A, E, I, O, U, B, D, F, J, L, M, P, R, S and T). All of these letters contain the relevant sounds symbolized by the letters in their names (e.g., bee /b/). Students received one point for each letter named correctly for a possible total of 26 points for this measure.

Number recognition. Children were shown single numerals from zero to nine on separate cards in a similar manner to the letter recognition test. Students were asked to name as many numbers as possible. At least six numerals needed to be named correctly for children to continue to the training phase of the study. Students received one point for each numeral named correctly for a possible total of ten points for this measure.

Word reading. Children were asked to read ten words from the core pre-primer list of the Harris and Jacobson’s basic reading vocabularies (Harris & Jacobson, 1982). The words were presented on separate cards one at a time. The words chosen utilized the 15 letters to be used later in the study. The words were: AT, BALL, DID, FOR, GO, ME, RED, SEE, TO and UP. The purpose was to assess novice word reading ability. Students received one point for each word correctly read for a total of 10 possible points for this measure.
Non-word decoding. A set of ten highly decodable nonwords was constructed from the 15 target letters. Four CV and six CVC nonwords, including BO, LE, SU, RI, FAP, POJ, TEF, DIB, MUR and JAT, were presented on separate cards one at a time. It was expected that partial alphabetic phase readers would have difficulty decoding any of the words on the list. Students able to fully decode more than three nonwords were not considered partial alphabetic phase readers and did not continue in the study.

Invented spelling pretest. Children were asked to invent spellings of ten CVC words. The words chosen were simple real words, whose phonetic spellings could be invented from the 15 target letters to be used in the study with vowels representing the long letter-name sound in pronunciations. Fifteen letter tiles were provided to eliminate reliance on handwriting or letter formation ability of the young children. Letter tiles were laid out on the top half of a large laminated chart. To begin, the researcher spoke the model word “bite.” The researcher then said, “I think bite is spelled /b/, /i/, /t/.” As each phoneme was spoken the researcher moved the corresponding letter to the bottom of the chart. Children were told that they could use three letters and the researcher pointed to the target spelling positions of left, middle, and right. Words chosen included: time, road, soup, bait, fire, lead, jail, food, more, and paid. Each word was then spoken aloud and the students were given as much time as they needed to move the letter tiles. Target phonetic spellings were TIM, ROD, SUP, BAT, FIR, LED, JAL, FUD, MOR, and PAD, respectively. The number of phonetically correct letters placed correctly in target spelling positions was scored. Each received one point for a total of 30 possible points for this measure.

Vocabulary. The Peabody Picture Vocabulary Test-4 (PPVT-4; Dunn & Dunn, 2007) was administered to assess the students’ receptive vocabulary. The PPVT-4 is an untimed test of receptive vocabulary for Standard American English. The test content covers a broad range of
receptive vocabulary levels, from preschool through adult, sampling words that represent 20 content areas across all levels of difficulty. Each page depicts four drawings. Students were asked to point to which drawing best described a word read aloud by the experimenter. The test-retest reliability coefficient of the PPVT-4 for age is .93 as reported in the manual, and the split-half reliability of the measure is reported as .94.

Training Conditions

After the pretests, students who qualified as partial alphabetic phase readers were randomly assigned to one of three phonemic awareness training conditions: phoneme segmentation with letters, phoneme segmentation with shapes, and no segmentation training. To do this, students at each school were ordered by their scores on pretests and triplets were formed beginning with the top three scores. Members of triplets were randomly assigned to the three conditions, yielding 20 children per condition total with nearly equal distribution across sites and conditions.

Table 1

*Number of Students Assigned to the Phonemic Segmentation Conditions for Each School Site.*

<table>
<thead>
<tr>
<th></th>
<th>Letter</th>
<th>Shape</th>
<th>Rhyming</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Child Care (20)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preschool</td>
<td>7</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Private School (27)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preschool</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Charter School (13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kindergarten</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
Participants received one of three types of treatments, either phonemic segmentation training with letters, or phonemic segmentation training with tokens displaying irrelevant shapes, or listening to a rhyming story. Following these treatments, posttests were given to assess effects of the segmentation training on spelling and vocabulary learning. First, children completed an invented spelling posttest to assess effects of training. Second, they were given a vocabulary learning task in which they were taught to say the names of a set of animal drawings in one session and the names of a set of face drawings in another session. Either spellings of the names or pairs of numbers appeared beneath the pictures during study periods but not on test trials. Task order (spellings vs. numbers seen first) and set content (faces vs. animals) were counterbalanced across children.

The four counterbalanced treatments for the vocabulary learning task were:

- **Group 1**: Set A (animals) taught first with spellings and Set F (faces) taught second with numbers;
- **Group 2**: Set A taught first with numbers and Set F taught second with spellings;
- **Group 3**: Set F taught first with spellings and Set A taught second with numbers;
- **Group 4**: Set F taught first with numbers and Set A taught second with spellings.

Children in all the training conditions were randomly assigned to one of the groups yielding 15 children per group. Lastly, several posttests were given to assess children’s recall of names taught in the vocabulary learning task.

**Phonemic Awareness (PA) Training.** Children were randomly assigned to one or another of two PA training conditions or a control condition. PA training was conducted with individual students. A game called *Mrs. Magic Mouth* was used to assist children in acquiring beginning phonemic awareness skills in a fun and integrative way (Ball & Blachman, 1991;
Uhry & Ehri, 1999). Twenty students received phonemic segmentation training utilizing letters and *Mrs. Magic Mouth*, while 20 students received the same segmentation training with *Mrs. Magic Mouth*, but with irrelevant geometric shapes to act as markers for segmenting the phonemes. Finally, 20 students constituted the Rhyming control group.

The game consisted of an 18” x 24” laminated poster depicting a drawing of a woman’s face with a large open mouth (see Figure 1). Thirty CV words were created by combining letters representing the ten consonants and five long vowels used in the study. Excluded from the list were the CV names taught later in the vocabulary learning task and several other combinations that were inappropriate. The CV words taught were: PA, DU, LI, TO, ME, RA, SU, LO, MI, SA, DO, MU, RI, FA, LE, TI, SO, BU, FI, RE, LA, TU, FO, JA, BI, RO, FU, MA, JO and PI. Combinations that created familiar words and names were placed at the beginning of the list. No definitions or discussions of the words were provided.

In both phonemic awareness training conditions utilizing segmentation (letters or shapes) 15 tokens were placed in the mouth. The letter and shape tokens were small round laminated discs, approximately the size of a quarter, that children could easily view and slide along the laminated poster into two Elkonin sound boxes below the drawing of the face. The letter condition utilized tokens labeled with letters corresponding to the phonemes in the simple consonant-vowel (CV) words spoken by the experimenter. The shape condition used the same tokens but displaying a variety of well-known geometric shapes, rather than letters. These shapes did not correspond to a sound or meaning and were simply utilized as a type of control marker to separate the phonemes in the spoken words.

In each segmentation training condition the experimenter slowly spoke a CV word as if *Mrs. Magic Mouth* were saying it. Words were spoken one by one in an order that remained
constant across conditions. To explain the task, segmentation of four words was modeled by the experimenter who said the word, then separately spoke the two sounds that comprised the word, then repeated the sounds while moving tokens into two sound boxes, then said the complete word while moving the index finger across and underneath the tokens. Letter tokens chosen in the demonstration corresponded to the sounds in the words, while shape tokens acted as markers to represent the number of phonemes spoken. Children were asked to repeat the segmentation of each word demonstrated by the experimenter and corrective feedback was provided.

In order to complete the training, students had to reach a criterion of five consecutive CV words segmented correctly without experimenter assistance. Results indicated that most of the children in this study very easily understood how to segment CV words. Initially, the experimenter was to demonstrate four CV words, have each child model how the experimenter segmented the sounds and provide corrective feedback. However, after the first demonstration, many of the children began to reach for the discs on their own without being prompted by the experimenter. Six children in the letter training condition and nine children in the shape training condition needed only the first example as demonstration and were able to reach the criterion in only five trials. Children learning to segment with letters needed between 5 and 13 CV word attempts to reach criterion, while children in the shape condition needed between 5 and 10 attempts to reach criterion. The total time for phonemic awareness training with Mrs. Magic Mouth was approximately 15 minutes in a single session, with only one student in the letter training condition needing a second session to reach criterion.
Figure 1

*Mrs. Magic Mouth and Elkonin Boxes used for Segmentation Training.*
**Rhyming.** Individual students participated in the rhyming control condition. They spent a comparable amount of time exposed to instruction in rhyming activities. As suggested by *The Creative Curriculum*, the researcher “read books that play with the sounds in words, such as those by Dr. Seuss” (Dodge et al., 2002, p. 132). At the beginning of the session the experimenter placed an 8 ½ ” X 11” piece of construction paper on the table in front of the student. Eight different colored crayons and four small pencils were available for the students to use. The experimenter began by asking the student “Do you know what rhymes are?” Most children replied that rhyming words sounded alike, or that the endings were similar. Many students gave an example of two words that rhymed. The experimenter showed the book *Hop on Pop* (Geisel, 1963), explaining that it was a book that contained many rhyming words. The experimenter then read the book aloud. Children had the opportunity to discuss rhyming with the experimenter, create their own rhymes and draw their favorite part of the book. Dictation of the child’s words was taken and written on sentence strips accompanying the drawing, as is the common practice in recommended early literacy activities.

**Posttests**

**Invented spelling.** One day following the phonemic awareness training, students were given the same invented spelling test they had completed before the training. Children were asked to produce inventive spellings of ten CVC words from the 15 target letters used in the study. All 15 letter markers were available for children to use in constructing their invented spellings attempts. The same words were utilized for the pretest and posttest, with the same scoring procedure. The purpose of this posttest was to ascertain any gains made as a result of phonemic awareness training. The Cronbach’s alpha reliability coefficient for this measure was .96.
**Vocabulary learning tasks.** In order to assess whether spellings would activate graphophonemic connections to better secure pronunciations and meanings of new words in memory we modified the vocabulary learning task used by Rosenthal and Ehri (2008). Instead of presenting drawings of low frequency real words we created cartoon like drawings of faces and animals in a similar repeated measure design in order to increase the attention and enjoyment of younger participants. Simplification of the vocabulary to be learned was accomplished by giving each drawing a name, that could be represented in orthography by only a consonant and vowel, rather than attempting to find unknown words with extremely simple spellings that may not be interesting or relevant to very young children. Instead of providing definitions for the meanings of words students heard two features from each drawing repeated during each vocabulary learning trial.

During separate sessions, all students were introduced to each of two sets of five drawings. Set A (Animals) consisted of five uniquely drawn animals on separate pages. The animals were readily recognizable but had distinguishing characteristics that gave the animal a novel name. Set F (Faces) consisted of five different faces drawn with distinguishing characteristics. All of the drawings were given simple two phoneme names that included the long letter-name sound of the vowel letter. All participants were shown each drawing individually and told about the distinguishing characteristics. Each child was taught a set of drawings labeled by numbers and a set of drawings labeled by letters. Each drawing in the set was shown separately on one 8 ½ x 11 inch page of a flip chart. Depending on the label condition, each set was accompanied by either a CV letter pair corresponding to the sounds in the name (e.g., LU for Lu, PO for Po) or a 2-digit number pair that remained constant each time the drawing was shown.
(e.g., 18 for Lu, 28 for Po). (See Figures 2 and 3 for the complete set of drawings, names, letters and numbers.)

After the initial study trial introducing a set of five drawings and their names, students were given up to 20 trials to learn and remember the names of the animals or faces. On each successive trial the student viewed the drawing without its label (letters or numbers) present and was asked to remember its name. “Can you tell me its name?” Five seconds were given for the child to attempt to remember the name of the drawing. Regardless of the response, the page was then flipped to show the same drawing with its accompanying label written directly underneath the drawing. In the letter condition, participants saw a corresponding CV spelling symbolizing the name, while in the number condition participants saw an unrelated two-digit number. The experimenter then said the drawing’s name and pointed out its distinguishing features without calling any attention to the accompanying label. “Lu. A cat with many colored polka dots is called Lu” or “Po, a boy with brown hair and freckles is called Po.” Children were asked to verbally repeat the name once. Each trial consisted of all the drawings in the set presented in random order and each participant received up to 20 learning trials with feedback. Five different random orders were used across trials. Criterion was reached when all drawings were named correctly for two successive trials. Students required between 5 and 20 trials to learn each set of words. Children were also asked to identify the features of each drawing after every third trial. The experimenter asked, “Can you tell me what was special about Lu?” Children answered with as many features as they remembered from hearing the features spoken by the experimenter after each name. No corrective feedback was given. Children received credit for each of two features per drawing for a total of 10 features in each trial. The Cronbach’s alpha reliability coefficient
for the number of words recalled across 15 trials was .93 for spelling trials and .94 for number label trials.

Figure 2

Animal Drawings, Labels and Features.

<table>
<thead>
<tr>
<th>Name</th>
<th>Spelling</th>
<th>Number</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>/fi/</td>
<td>FE</td>
<td>26</td>
<td>A pig with wings is called Fe.</td>
</tr>
<tr>
<td>/mo/</td>
<td>MO</td>
<td>93</td>
<td>A dinosaur wearing sneakers is called Mo.</td>
</tr>
<tr>
<td>/lu/</td>
<td>LU</td>
<td>18</td>
<td>A cat with many colored polka dots is called Lu.</td>
</tr>
<tr>
<td>/be/</td>
<td>BA</td>
<td>47</td>
<td>A dog with a really long tail is called Ba.</td>
</tr>
<tr>
<td>/jay/</td>
<td>JI</td>
<td>50</td>
<td>A squirrel wearing glasses is called Ji.</td>
</tr>
</tbody>
</table>

Note. International Phonetic Alphabet (IPA) symbols to represent pronunciations.
Figure 3

*Face Drawings, Labels and Features.*

<table>
<thead>
<tr>
<th>Name</th>
<th>Spelling</th>
<th>Number</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>/po/</td>
<td>PO</td>
<td>28</td>
<td>A boy with brown hair and freckles is called Po.</td>
</tr>
<tr>
<td>/di/</td>
<td>DE</td>
<td>90</td>
<td>A lady with blonde hair and glasses is called De.</td>
</tr>
<tr>
<td>/say/</td>
<td>SI</td>
<td>17</td>
<td>A man with no hair and a beard is called Si.</td>
</tr>
<tr>
<td>/ru/</td>
<td>RU</td>
<td>46</td>
<td>A girl with red hair and green eyes is called Ru.</td>
</tr>
<tr>
<td>/te/</td>
<td>TA</td>
<td>35</td>
<td>A girl with black curly hair is called Ta.</td>
</tr>
</tbody>
</table>

Note. International Phonetic Alphabet (IPA) symbols to represent pronunciations.
On a subsequent day the second set of drawings was introduced, this time with the opposite label (letter or number) from the first set of drawings. The same procedures were followed and the same posttests were administered on the day after vocabulary word learning. The same randomly determined orders were applied in ordering the two sets of drawings across trials. For example, the cat (LU) in Set A always appeared in the same position within any trial as the girl with black curly hair (TA) in Set F. Also for each set, the same order was followed for letter and number labels.

Several posttests for each set of drawings were given the day after word learning on that set was completed. A total of four days was devoted to word learning and post testing. Posttests were administered individually in the following order: Recalling names of drawings, recalling names associated with spellings and numbers, recalling features of drawings.

**Recalling names of drawings.** Students were shown the drawings in the set again, without accompanying labels and asked to remember their names. The experimenter showed each drawing and asked the child, “Do you remember this name?” One point was given for each name remembered correctly for a maximum score of five. The first response was taken and no corrective feedback was given for any incorrect answers. The purpose of this posttest was to ascertain how well children remembered the new vocabulary words (names) learned in the word-learning task.

**Recalling names associated with spellings and numbers.** Students were asked to say the name of the drawing when seeing only the accompanying label, a CV word in the spelling condition and a two-digit pair in the number condition. The experimenter showed a written label from the word-learning task on a separate card. No drawings were shown. The experimenter asked, “Do you remember which animal (or face) went with this label?” One point was given for
each correct name spoken for a possible total of five points. The purpose of this task was to assess whether students noticed and remembered the accompanying labels shown during the vocabulary learning trials, even though no attention was drawn to any labels accompanying the drawings. If students remembered words labeled with spellings better than those labeled with numbers, this suggests that spellings were retained in memory to help even partial alphabetic phase children remember words better.

**Recalling features of drawings.** Finally, the experimenter spoke the names without showing the drawings or labels. Students were asked to remember the distinguishing features of the animal or face. The experimenter said, “Now I’d like you to tell me what was special about this animal (or face.) Mo. What was special about Mo?” Each drawing had two possible features that had been repeated orally during each word learning trial, regardless of condition. Recall of each feature for five drawings in each set yielded a total of ten points for this measure. The purpose of this measure was to determine whether segmentation training or exposure to spellings had any effect on children’s memory for the meaning of words. The Cronbach’s alpha reliability coefficient was .68 for semantic feature memory.

**Data Analyses**

In order to assess the effect of phonemic awareness training, an ANOVA compared the performance of each student on the invented spelling pretest and posttest and the number of trials needed to reach criterion in the letter and shape segmentation conditions. In order to determine whether spellings have mnemonic value for vocabulary learning for children in the partial alphabetic phase of reading, and whether phonemic segmentation training enhances the impact of spellings on vocabulary learning, ANOVAs were conducted to assess the main effects and interactions involving the type of segmentation training (letter vs. shape vs. no segmentation
rhyming training) and word learning set (letters vs. numbers) on all four posttest measures and on the number of word learning trials needed to reach criterion.

Six separate analysis of variance (ANOVA) were conducted to assess the effect of the two independent variables on learning and remembering new names in the vocabulary learning task: phonemic awareness condition (letter tokens vs. shape tokens vs. no segmentation training) and the label seen during training (spellings vs. number pairs). The dependent measures were performance on the five posttests. Dependent measures included: the number of names of drawings recalled, the number of names recalled when seeing only the accompanying spellings or number labels, the number of distinguishing features remembered for each drawing, and memory for the labels accompanying drawings and the number of letters correct in the invented spelling task. A final analysis included the number of learning trials needed to reach criterion as a dependent measure.

A preliminary ANOVA was also conducted to assess any difference in word learning between drawing sets (animals or faces) and order of exposure to spellings and numbers (spellings first, numbers second or numbers first, spellings second) as the between-subjects, independent variables in the counterbalanced design. Dependent measures included within subject differences in the number of learning trials needed to reach criterion and number of names remembered.

A mixed ANOVA was also conducted to compare the growth in vocabulary learning from trial to trial. The independent variables were phoneme segmentation training (letters vs. numbers vs. no training), print type accompanying the drawings (spellings vs. numbers), and trial (fifteen trials). The latter two variables were repeated measures.
Chapter 5

Results

Characteristics of Participants

Pretests revealed that the children in this study \((N = 60)\) were solidly in the partial alphabetic phase of reading development. Mean values are shown in Table 2. Students were well versed in letter name knowledge \((M = 25.23, SD = 1.36, 26\) maximum) with qualifying children knowing almost all the letters within one second of viewing time. Minor confusion with letters like W, V, Y and H was evident and expected of this age group. Numeral name knowledge was also excellent, with most students correctly identifying almost all of the numerals \((M = 9.63, SD = .84, 10\) maximum). Again, only minor confusion between the numerals 6 and 9 appeared, with most students identifying the numerals orally within one second of seeing them presented. Children also demonstrated that they were not yet reading words \((M = .82, SD = 1.66, 10\) maximum) or non-words \((M = .18, SD = .624, 10\) maximum). Seventy percent of the children could not read any real words, while ninety percent read no non-words.

Vocabulary performance on the PPVT-4 was higher than national norms with a mean standardized score of 111.87 \((SD = 16.48)\). Several students had extremely high scores that skewed the overall results. Two students scored over 145; one female from a private preschool and one male from the public university setting. Three additional girls from the public university sites had scores of 135, as did two females from the private preschools. Only one male from the charter school Kindergarten had an extremely low standardized score of 71. Segmentation training groups did not differ significantly on any of the pretests or vocabulary scores, as shown in Table 2. Also, the four counterbalanced groups did not differ on any pretests \((all ps > .2)\). Overall, the results of the pretests indicated that, on average, the students utilized in this study
were functioning at a slightly higher level than what might be expected for children of this age. This may be a consequence of recruiting participants from early learning centers enrolling children of college students, as well as a charter school and several private preschools where parents were highly involved in their children’s learning. The three PA training groups did not differ on pretests (see Table 1), suggesting that any differences in the representation of site across conditions made no difference. Because screening tests were used to qualify participants and to limit variability among students on their literacy skills, any differences in the numbers of students from different sites and grades is mitigated. There were too few observations in each site-by-treatment-group cell to conduct statistical analyses.

Table 2


<table>
<thead>
<tr>
<th>PA Training</th>
<th>Letter</th>
<th>Shape</th>
<th>Rhyming</th>
<th>Total</th>
<th>F (p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Age (Months)</td>
<td>58.40 (5.02)</td>
<td>60.30 (4.61)</td>
<td>56.90 (5.41)</td>
<td>58.53 (5.13)</td>
<td>2.3 (.11)</td>
</tr>
<tr>
<td>Gender</td>
<td>13F; 7M</td>
<td>13F; 7M</td>
<td>12F; 8M</td>
<td>38F; 22M</td>
<td></td>
</tr>
<tr>
<td>Letters (26)</td>
<td>25.15 (1.46)</td>
<td>25.10 (1.65)</td>
<td>25.45 (.89)</td>
<td>25.23 (1.36)</td>
<td>.38 (.69)</td>
</tr>
<tr>
<td>Numerals (10)</td>
<td>9.65 (.81)</td>
<td>9.55 (1.05)</td>
<td>9.70 (.66)</td>
<td>9.63 (.84)</td>
<td>.16 (.85)</td>
</tr>
<tr>
<td>Word reading (10)</td>
<td>0.55 (1.28)</td>
<td>1.35 (2.25)</td>
<td>0.55 (1.19)</td>
<td>0.82 (1.66)</td>
<td>1.58 (.22)</td>
</tr>
<tr>
<td>Non-word reading (10)</td>
<td>0.10 (.45)</td>
<td>0.35 (.93)</td>
<td>0.10 (.31)</td>
<td>0.18 (.62)</td>
<td>1.07 (.35)</td>
</tr>
<tr>
<td>PPVT (SS)</td>
<td>110.30 (18.21)</td>
<td>115.00 (15.13)</td>
<td>110.30 (16.35)</td>
<td>111.87 (16.48)</td>
<td>0.53 (.59)</td>
</tr>
<tr>
<td>Invented Spelling (30)</td>
<td>14.30 (8.29)</td>
<td>14.95 (8.59)</td>
<td>11.20 (8.89)</td>
<td>13.48 (8.61)</td>
<td>1.09 (.34)</td>
</tr>
</tbody>
</table>

PA Training = Phonemic Awareness Training Group
PPVT (SS) = Peabody Picture Vocabulary Test - 4 (Standardized Score)
Phonemic Awareness Training

Children in both PA training groups practiced segmenting CV words with letters or shape markers until they reached a criterion of five consecutive words segmented correctly. An ANOVA was conducted on the number of trials required to reach criterion, not including the initial demonstration trial. The independent variable was PA treatment group. Results revealed no significant main effect of treatment with $F < 1$ (see Table 3). Students needed an average of 7.85 ($SD=2.32$) word trials when learning to segment with letters, and 7.25 ($SD=1.45$) word trials in the shape condition, indicating that having to match letters to sounds in words did not make the task more difficult than having to match unrelated shapes to the sounds. However, the tasks proved very easy for many students with 15 out of 40 children performing perfectly after only one demonstration, thus reaching criterion in five trials.

To assess the effects of phonemic awareness training, the invented spelling test that had been given as a pretest was re-administered the day after training. Students selected from 15 letter tiles to spell 10 CVC words. In contrast to the PA training where they segmented CV words, on this test they were given CVC words to spell. An ANOVA was applied to the number of letters spelled phonemically. The independent variables were training condition (letter vs. shape vs. control) and time of test (pre vs. posttest). Results shown in Table 3 revealed no main effects of training condition or time of test. However, the interaction between the two variables was significant. Comparison of mean performance of the groups in Table 4 reveals the source of the interaction. Scores of the letter group increased from pretest to posttest whereas scores of the other groups remained the same or declined slightly. These findings indicate that PA training with letters transferred and improved children’s ability to spell harder words whereas PA training with shape symbols unrelated to sounds did not improve spelling performance.
To localize further the source of the interaction, separate ANOVAs were conducted on pretests and posttests. As is evident in Table 2, means on the pretests did not differ among the treatment groups. However, means on the posttest were significantly different, $F(2, 57) = 3.41, p = .04$ (See Table 4). Post hoc Tukey tests revealed that the letters group outperformed both the shapes and control groups who did not differ. These findings confirm that the children who were taught to segment words with letters learned what they were taught. Their invented spellings contained more phonemically correct letters than those of the group taught to segment with shapes, and those of the rhyming control group.

**Vocabulary Learning**

After phonemic awareness training and the invented spelling test were completed, students performed the vocabulary learning task, which was conducted as a repeated measure with all students learning the names of two sets of drawings, one labeled with letters and another labeled with numbers during study periods but not test trials. Each participant was given up to 20 learning trials with feedback to reach criterion, when all drawings were named correctly on two successive trials.

A preliminary analysis of word learning was conducted to compare effects of two sets of drawings and the order of two word learning tasks comprising the counterbalanced design. Analysis of variance (ANOVA) was conducted with the learning order and drawing set as the between subjects, independent variables. The dependent measure was the difference between the number of trials needed to reach criterion in learning words with numbers and with letters. No significant main effects or interaction were found (see Table 5). Word set and learning task order were dropped from any further consideration.
To examine whether the type of PA training influenced students’ vocabulary learning, ANOVAs were conducted. The independent variables were PA training condition (letters vs. shapes vs. control) and the type of label that accompanied drawings during study and feedback periods but not during the test trials (spellings vs. numbers). The latter was a repeated measure. Several dependent variables were examined to assess what students learned and remembered. Results of the ANOVAs are reported in Table 3.

The number of trials required before students reached criterion of two successfully correct trials was recorded when children were exposed to spellings of the names and when children were exposed to irrelevant numbers during learning. As shown in Table 3, the ANOVA revealed a significant main effect for label type with children viewing spellings reaching criterion in significantly fewer trials than those viewing number labels. Means are shown in Table 4. There was no significant main effect of phonemic awareness training and no interaction (see Table 3). These results show that exposing these partial alphabetic readers to the grapheme-phoneme mappings of words during study and feedback periods but not during tests facilitated learning the pronunciations of the vocabulary names that were taught. Cohen effect sizes favoring spellings over numbers as print labels were moderate ranging from $d = .43$ (PA shape condition), $d = .49$ (PA letter condition), and $d = .59$ (rhyming condition).

We also assessed the number of features remembered after every third vocabulary learning trial. However, this measure of semantic learning was not continued until children reached a criterion of mastery. Children reaching the vocabulary learning criterion very early did not continue past the 6th trial and were not asked to recall features a second time. Data for every participant was only available after the 3rd trial and at posttest the next day. Data for the 6th trial was missing in four instances because children reached criterion by the fifth or sixth vocabulary trial.
learning trial and were not asked to recall features until the posttest one day later. There were no main effects or interaction for feature recall at any time. Means and standard deviations for PA training groups for feature recall after the 3rd and 6th trials are reported in Table 4. ANOVA results after the 6th trial is reported in Table 3.

Posttests were administered one day after learning. The measures included the number of vocabulary names remembered when shown the drawings only, the number of names remembered when shown the print labels only, and the number of features of the animals or faces remembered when hearing their names spoken. ANOVAs were conducted on each measure with PA training condition and print label type as the independent variables. Results of the ANOVAs are reported in Table 3. There were no significant main effects of phonemic awareness training in any of the analyses, and no significant interaction on any of the dependent measures.

The number of names remembered in response to drawings that had been seen with spellings was somewhat higher than names remembered when viewing drawings seen with number labels, but not by a significant margin. This was in contrast to our expectation based on the results of the pilot study where students remembered significantly more names when viewing the drawings with spellings. One reason for this is that all children were taught to criterion during the learning trials so recall remained high one day later. The mean percentage of pronunciations recalled was 84% (letter condition) and 79% (number).

Across the ANOVAs of posttests, one significant main effect of print label emerged on children’s ability to identify the name associated with the print label that they saw during learning (see Tables 3 and 4). Children who viewed letters that spelled sounds in the words identified the words much better than children who viewed numbers that were unrelated to the words, with means of 75% vs. 18% correct respectively. This shows that children did pay
attention to the spellings of words even though they were not directed to do so. The relationship of spellings to the pronunciations of words was processed implicitly, as no attention was drawn to spellings.

The number of semantic features that children recalled in response to spoken names was also subjected to an ANOVA with PA treatment and print label as the independent variables. As evident in Table 5, the number of features recalled was not affected by label type. This shows that seeing spellings of words during learning did not influence children’s learning the meanings of words.
ALPHABET KNOWLEDGE AND SEGMENTATION TRAINING

Table 3

*Analyses of Variance for Phonemic Awareness Training, Vocabulary Learning and Posttest Measures.*

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>p</th>
<th>Partial eta²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Phonemic Awareness Training</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trials to Criterion in Segmentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training Condition</td>
<td>1</td>
<td>3.60</td>
<td>.96</td>
<td>.33</td>
<td>.03</td>
</tr>
<tr>
<td>Error</td>
<td>38</td>
<td>3.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Invented Spelling Posttest</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training Condition</td>
<td>2</td>
<td>306.11</td>
<td>2.09</td>
<td>.13</td>
<td>.07</td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>146.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Point</td>
<td>1</td>
<td>36.30</td>
<td>3.50</td>
<td>.07</td>
<td>.06</td>
</tr>
<tr>
<td>Training X Test Point</td>
<td>2</td>
<td>57.48</td>
<td>5.54</td>
<td>.01*</td>
<td>.01</td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>10.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Word Learning Task</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trials to Criterion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training Condition</td>
<td>2</td>
<td>15.83</td>
<td>.68</td>
<td>.51</td>
<td>.02</td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>23.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Label</td>
<td>1</td>
<td>122.01</td>
<td>13.65</td>
<td>.000***</td>
<td>.19</td>
</tr>
<tr>
<td>Label X Training</td>
<td>2</td>
<td>1.51</td>
<td>.17</td>
<td>.85</td>
<td>.006</td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>8.90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Feature Learning after 6th Trial</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training Condition</td>
<td>2</td>
<td>9.03</td>
<td>.71</td>
<td>.50</td>
<td>.026</td>
</tr>
<tr>
<td>Error</td>
<td>53</td>
<td>12.75</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Label</td>
<td>1</td>
<td>2.10</td>
<td>.32</td>
<td>.57</td>
<td>.006</td>
</tr>
<tr>
<td>Label X Training</td>
<td>2</td>
<td>7.98</td>
<td>1.21</td>
<td>.31</td>
<td>.04</td>
</tr>
<tr>
<td>Error</td>
<td>53</td>
<td>6.57</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3 continued

*Analyses of Variance for Phonemic Awareness Training, Vocabulary Learning and Posttest Measures.*

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>Mean1</th>
<th>Mean2</th>
<th>Mean3</th>
<th>Mean4</th>
<th>Mean5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Posttests</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>See Drawing, Recall Name</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training</td>
<td>2</td>
<td>.40</td>
<td>.36</td>
<td>.70</td>
<td>.012</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>1.12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Label</td>
<td>1</td>
<td>1.88</td>
<td>1.95</td>
<td>.17</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Label X Training</td>
<td>2</td>
<td>.40</td>
<td>.42</td>
<td>.66</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>.96</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>See Print Label, Recall Name</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training</td>
<td>2</td>
<td>4.23</td>
<td>1.82</td>
<td>.17</td>
<td>.06</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>2.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Label</td>
<td>1</td>
<td>240.83</td>
<td>122.46</td>
<td>.0001***</td>
<td>.68</td>
<td></td>
</tr>
<tr>
<td>Label X Training</td>
<td>2</td>
<td>.33</td>
<td>.17</td>
<td>.98</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>1.97</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hear Name, Recall Features</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training</td>
<td>2</td>
<td>3.90</td>
<td>.40</td>
<td>.67</td>
<td>.01</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>9.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Label</td>
<td>1</td>
<td>1.63</td>
<td>.25</td>
<td>.62</td>
<td>.004</td>
<td></td>
</tr>
<tr>
<td>Label X Training</td>
<td>2</td>
<td>8.63</td>
<td>1.33</td>
<td>.27</td>
<td>.04</td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>57</td>
<td>6.51</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *p<.05; **p<.01; ***p<.001*
Table 4

Means and Standard Deviations of the Phonemic Awareness Letter and Shape Training Groups and the Rhyming Control Group in the Invented Spelling and Vocabulary Learning Tasks.

<table>
<thead>
<tr>
<th>Tasks and Measures</th>
<th>Letter</th>
<th>Shape</th>
<th>Rhyming</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA Training TTC</td>
<td>7.85 (2.32)</td>
<td>7.25 (1.45)</td>
<td>---</td>
<td>7.55 (1.93)</td>
</tr>
<tr>
<td>Invented Spelling</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest (30)</td>
<td>14.30 (8.29)</td>
<td>14.95 (8.59)</td>
<td>11.20 (8.89)</td>
<td>13.48 (8.61)</td>
</tr>
<tr>
<td>Posttest (30)</td>
<td>18.15 (7.92)</td>
<td>14.95 (10.12)</td>
<td>10.65 (9.16)</td>
<td>14.58 (9.48)</td>
</tr>
<tr>
<td>Difference</td>
<td>3.85</td>
<td>0.00</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Vocabulary Learning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn Names Trials to Criterion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With Spellings (20 max)</td>
<td>9.65 (2.56)</td>
<td>10.60 (4.08)</td>
<td>10.40 (4.06)</td>
<td>10.22 (3.60)</td>
</tr>
<tr>
<td>With Numbers (20 max)</td>
<td>11.35 (4.21)</td>
<td>12.50 (4.69)</td>
<td>12.85 (4.22)</td>
<td>12.23 (4.35)</td>
</tr>
<tr>
<td>Difference</td>
<td>1.70</td>
<td>1.90</td>
<td>2.45</td>
<td></td>
</tr>
<tr>
<td>Feature Learning After 3rd Trial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With Spellings (10 max)</td>
<td>3.65 (2.48)</td>
<td>2.83 (2.48)</td>
<td>3.56 (2.68)</td>
<td>3.36 (2.53)</td>
</tr>
<tr>
<td>With Numbers (10 max)</td>
<td>3.50 (2.71)</td>
<td>3.39 (2.87)</td>
<td>3.39 (2.83)</td>
<td>3.43 (2.75)</td>
</tr>
<tr>
<td>Feature Learning After 6th Trial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With Spellings (10 max)</td>
<td>6.00 (3.03)</td>
<td>4.17 (2.33)</td>
<td>5.28 (3.30)</td>
<td>5.18 (2.97)</td>
</tr>
<tr>
<td>With Numbers (10 max)</td>
<td>5.60 (2.84)</td>
<td>5.50 (3.81)</td>
<td>5.17 (3.19)</td>
<td>5.43 (3.23)</td>
</tr>
<tr>
<td>See Picture Recall Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spelling (5 max)</td>
<td>4.20 (1.36)</td>
<td>4.30 (0.80)</td>
<td>4.10 (.97)</td>
<td>4.20 (1.05)</td>
</tr>
<tr>
<td>Numbers (5 max)</td>
<td>4.15 (.93)</td>
<td>3.85 (1.14)</td>
<td>3.85 (.81)</td>
<td>3.95 (.96)</td>
</tr>
</tbody>
</table>
Table 4 continued

*Means and Standard Deviations of the Phonemic Awareness Letter and Shape Training Groups and the Rhyming Control Group in the Invented Spelling and Vocabulary Learning Tasks.*

<table>
<thead>
<tr>
<th>See Print Recall Name</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Print = Spelling (5 max)</td>
<td>3.70 (1.66)</td>
<td>4.10 (1.25)</td>
<td>3.40 (1.98)</td>
<td>3.73 (1.66)</td>
</tr>
<tr>
<td>Print = Numbers (5 max)</td>
<td>0.90 (1.37)</td>
<td>1.20 (1.51)</td>
<td>0.60 (.681)</td>
<td>0.90 (1.25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hear Name Recall Features</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spelling (10 max)</td>
<td>7.20 (2.78)</td>
<td>6.75 (2.45)</td>
<td>6.40 (2.62)</td>
<td>6.78 (2.81)</td>
</tr>
<tr>
<td>Numbers (10 max)</td>
<td>6.40 (2.62)</td>
<td>7.75 (2.57)</td>
<td>6.90 (3.35)</td>
<td>7.02 (2.88)</td>
</tr>
</tbody>
</table>

*Note.* There were 20 children in each of the treatment groups.
Table 5

*Vocabulary Learning: Preliminary Analysis of Variance of Letter vs. Number Difference Score on Trials to Criterion Measure as a Function of Task Order and Word Set.*

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>sig.(p)</th>
<th>Partial eta²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Order</td>
<td>1</td>
<td>22.82</td>
<td>1.27</td>
<td>.27</td>
<td>.02</td>
</tr>
<tr>
<td>Word Set</td>
<td>1</td>
<td>.42</td>
<td>.02</td>
<td>.88</td>
<td>.00</td>
</tr>
<tr>
<td>Order X Set</td>
<td>1</td>
<td>1.35</td>
<td>.08</td>
<td>.79</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>56</td>
<td>18.04</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To further explore growth in word learning from trial to trial we conducted an ANOVA with phonemic awareness training as a between subjects independent variable and print label and trials 1-15 as repeated measures. The number of names correctly recalled on each trial was the dependent variable. Significant growth from trial to trial was expected. Results confirmed a main effect of print label, and a significant interaction between print label and trial. As evident in Figure 6, spellings facilitated word learning more than numbers as trials progressed becoming increasingly large after Trial 6. No other main effects or interactions were significant (see Table 6).
Table 6

*Analysis of Variance of Name Learning Over 15 Trials*

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>MS</th>
<th>F-stat</th>
<th>sig.(p)</th>
<th>Partial eta²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA Training</td>
<td>2</td>
<td>9.26</td>
<td>0.51</td>
<td>.61</td>
<td>.02</td>
</tr>
<tr>
<td>Error (label)</td>
<td>57</td>
<td>4.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trials</td>
<td>14</td>
<td>253.76</td>
<td>319.28</td>
<td>.0001***</td>
<td>.85</td>
</tr>
<tr>
<td>Trials X Training</td>
<td>28</td>
<td>.62</td>
<td>0.77</td>
<td>.79</td>
<td>.03</td>
</tr>
<tr>
<td>Error (trials)</td>
<td>798</td>
<td>.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print Label</td>
<td>1</td>
<td>33.35</td>
<td>6.96</td>
<td>.01**</td>
<td>.11</td>
</tr>
<tr>
<td>Label X Training</td>
<td>2</td>
<td>2.69</td>
<td>.56</td>
<td>.57</td>
<td>.02</td>
</tr>
<tr>
<td>Label X Trial</td>
<td>14</td>
<td>1.11</td>
<td>1.77</td>
<td>.04*</td>
<td>.03</td>
</tr>
<tr>
<td>Label X Trials X Training</td>
<td>28</td>
<td>.64</td>
<td>1.01</td>
<td>.45</td>
<td>.03</td>
</tr>
<tr>
<td>Error</td>
<td>798</td>
<td>.63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. *p<.05; **p<.01; ***p<.001

The first fifteen trials represented graphically in Figure 4 reveal the main effect for print label. Children viewing spellings that labeled the name of the drawing reached criterion significantly faster than those who viewed number labels. From Figure 4 it is apparent that vocabulary words in both conditions were recalled perfectly by almost all students at the end of
learning, so this may explain why differences favoring the spelling exposure condition were not apparent on posttests given the next day. Very little forgetting occurred.

**Figure 4**

*Mean number of names recalled in word learning task over 15 trials.*

---

**Correlational Analysis**

Pearson correlation coefficients were calculated to examine relationships between performance in the various tasks (see Table 7). It has been suggested that students with higher vocabularies are more successful in deriving the meaning of unknown words in texts and that building a strong early vocabulary through shared reading will serve as the foundation for learning how to read (Cunningham, 2005). Significant correlations were found between PPVT vocabulary scores and three posttest measures. Children with higher vocabulary scores needed significantly fewer trials to learn new names in the number label condition, that is when they
were not supported by spellings of the names. They could recall more names when shown spellings on the posttest. They could recall more semantic features in response to hearing the names of the drawings when they had seen spellings during learning. These relationships may reflect generally higher cognitive skill among students with higher vocabularies. However, there was little correlation between vocabulary scores and other posttest measures.

Several other significant correlations were evident between posttest measures. As would be expected, the highest correlation (.86) indicated a strong relationship between invented spelling pretest and posttest. Strong positive correlations existed between invented spelling pretest and posttest measures and performance seeing spellings and recalling names, while negative correlations existed between invented spelling pre and posttests and performance seeing number labels and recalling names. This may indicate that students who made connections between letter labels and the sounds of the names tended to function at significantly lower levels with number labels because there was no connection to be made when recalling the names in number conditions. This indicates that the better spellers paid more attention to associations between character names and their labels when the labels were spellings of the names being learned but less attention to associations between names and labels when the labels were numbers compared to students who were poorer spellers.

Scores on invented spelling pretests and posttests were also highly correlated with trials to criterion in recalling names when spellings supported memory. In contrast, invented spelling scores were not significantly correlated with performance supported by number labels. In addition, invented spelling pretest and posttest scores were significantly correlated with the ability to recall the name when shown the spelling label but not the number label on the posttests.
These findings indicate that spelling knowledge improved performance when spellings supported learning.
### Table 7

**Correlations between PPVT-4 and Posttest Measures**

<table>
<thead>
<tr>
<th>Tasks</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 PPVT-4 Vocabulary</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>111.87</td>
<td>16.48</td>
</tr>
<tr>
<td>2 PA Training</td>
<td>.04</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5.17</td>
<td>3.88</td>
</tr>
<tr>
<td>3 Spelling Pretest</td>
<td>.14</td>
<td>-.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.48</td>
<td>8.61</td>
</tr>
<tr>
<td>4 Spelling Posttest</td>
<td>.07</td>
<td>.11</td>
<td>.86**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14.58</td>
<td>9.48</td>
</tr>
<tr>
<td>5 Learn Names w Sp (TTC)</td>
<td>-.20</td>
<td>.05</td>
<td>-.34**</td>
<td>-.34**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10.22</td>
<td>3.60</td>
</tr>
<tr>
<td>6 Learn Names w N (TTC)</td>
<td>-.34**</td>
<td>.03</td>
<td>-.28</td>
<td>.32</td>
<td>.46**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12.23</td>
<td>4.35</td>
</tr>
<tr>
<td>7 See Draw Recall Name-Sp</td>
<td>.09</td>
<td>.08</td>
<td>.13</td>
<td>.02</td>
<td>-.01</td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.20</td>
<td>1.05</td>
</tr>
<tr>
<td>8 See Draw Recall Name-N</td>
<td>.20</td>
<td>.13</td>
<td>-.04</td>
<td>.09</td>
<td>-.22</td>
<td>-.34**</td>
<td>.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3.95</td>
<td>.96</td>
</tr>
<tr>
<td>9 See Label Recall Name-Sp</td>
<td>.32*</td>
<td>.13</td>
<td>.49**</td>
<td>.44**</td>
<td>-.19</td>
<td>-.11</td>
<td>.31*</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
<td>3.73</td>
<td>1.66</td>
</tr>
<tr>
<td>10 See Label Recall Name-N</td>
<td>-.02</td>
<td>.34**</td>
<td>-.17</td>
<td>-.12</td>
<td>-.003</td>
<td>.07</td>
<td>.12</td>
<td>.22</td>
<td>.12</td>
<td></td>
<td></td>
<td>.90</td>
<td>1.25</td>
</tr>
<tr>
<td>11 Hear Name Recall Feat-Sp</td>
<td>.26*</td>
<td>.15</td>
<td>.16</td>
<td>.09</td>
<td>-.14</td>
<td>-.07</td>
<td>.28*</td>
<td>.20</td>
<td>.25</td>
<td>.29*</td>
<td></td>
<td>6.78</td>
<td>2.80</td>
</tr>
<tr>
<td>12 Hear Name Recall Feat-N</td>
<td>.17</td>
<td>.01</td>
<td>.32*</td>
<td>.29*</td>
<td>-.28*</td>
<td>-.12</td>
<td>-.21</td>
<td>.16</td>
<td>.24</td>
<td>.08</td>
<td>.19</td>
<td>7.02</td>
<td>2.88</td>
</tr>
</tbody>
</table>

Note. *p < .05, **p < .01. PA (phonemic awareness). TTC (trials to criterion). Sp (spelling print label). N (number print label). Feat (features of drawing).
Chapter 6

Discussion

Summary of Results

The main purpose of this study was to explore whether partial alphabetic phase children would be able to benefit from letter name knowledge combined with phoneme segmentation training in learning and remembering new words better when exposed to simple spellings of the words than when exposed to irrelevant number symbols. We hypothesized that preschoolers and early kindergartners taught to segment words with letters would outperform those trained with shape tokens and those read a rhyming book on invented spelling tests. We also hypothesized that students who saw the spellings of new vocabulary words (names of characters) would learn names in fewer trials, remember the names and features better, and would be able to better recognize letter labels when presented alone. Additionally, we wanted to show that phonemic segmentation training was an appropriate and helpful skill to teach kindergartners and prekindergartners who knew the names of some alphabet letters. All of these hypotheses were specifically tested with partial alphabetic phase readers.

To assess phonemic awareness training, qualifying children were divided into triplets based on pretest performance and randomly assigned to one of three conditions: Phonemic segmentation training with letter tokens, phonemic segmentation training with irrelevant shapes as tokens or a rhyming control group. Students receiving phonemic segmentation training utilized the game Mrs. Magic Mouth, while students in the rhyming control group were read *Hop on Pop* (Geisel, 1963), given the opportunity to discuss rhymes with the experimenter, and draw anything that interested them. All students were given an invented spelling pretest before training and the same posttest after training. Results indicated that children receiving phonemic
segmentation training with letters were the only group to make significant gains on the spelling posttest as a result of the training. These findings confirm that the children who were taught to segment words with letters learned what they were taught. Their invented spellings contained more phonemically correct letters than those of the group taught to segment with shapes, and those of the rhyming control group.

It was also evident that phonemic segmentation training was an appropriate skill to teach prekindergartners and kindergartners who knew the names of alphabet letters. Every child easily understood the concept of separating the sounds into Elkonin boxes and enjoyed the game as it was presented. In fact, letter tokens appeared to be easier, not harder, for children to understand than training with the irrelevant shape tokens. From observing student learning, it appeared that the symbol tokens might have confused children who already knew letter names and related sound correspondences. There was, however, no difference in the number of trials needed to reach criterion in the letter and shape segmentation groups. Only one child in the letter condition was unable to reach criterion within the 15-minute session allotted for training, and needed a separate session to complete the training.

When given the invented spelling pretests prior to phonemic segmentation training most children could orally isolate and physically choose the appropriate letter to represent the first phoneme in the CVC words. Few children were able to spell the consonant for the last phoneme heard, and still fewer were able to choose an appropriate vowel letter to represent the middle sound. A singular focus on initial grapheme-phoneme connections is typical of children in the partial alphabetic phase of reading. However, after the phonemic awareness training focusing on segmenting CV words, those trained with Mrs. Magic Mouth and letters were better able to identify all the sounds and spellings of target words at posttest. Students receiving training with
Mrs. Magic Mouth and shape tokens did not show any improvement in associating the middle or ending sounds at posttest. Those receiving rhyming training appeared to focus more on the ending sounds of words, often verbalizing the final sound first and choosing the corresponding letter to place in the first sound box, then using random letters to fill in for the remainder of the word at posttest. Scores for this group decreased after receiving the rhyme treatment that did not involve any sound segmentation activity.

Regarding vocabulary word learning, we hypothesized that students seeing the spellings of new vocabulary words (names) would learn the words in fewer trials, remember the names and characteristics better, and would be able to better recognize spellings when presented alone compared to not seeing spellings. Students were randomly assigned to one of four counterbalanced groups within this repeated measures design. Participants were taught to say the names of a set of animal drawings in one session and the names of a set of face drawings in another session. Either spellings of the names or pairs of numbers appeared beneath the pictures during study periods but not on test trials. Each participant was given up to 20 learning trials with feedback to reach criterion, when all drawings were named correctly on two successive trials. A series of posttests followed the day after children reached criterion.

Results showed that vocabulary learning supported by spellings was superior to learning without spellings. When students were exposed to spellings during study periods but not during tests, they learned new words in significantly fewer trials than when they were exposed to number labels. On the posttests that showed students the labels that had accompanied the drawings and asked them to recall the names of the characters, spellings produced much better recall than number labels. This suggests that students had formed connections between the letter labels and their pronunciations during learning. On posttests that showed students the character
drawing and asked them to recall its name, recall was somewhat better when spellings had been seen than not seen. However, the difference fell short of significance possibly due to ceiling effects that resulted because students were taught the words to a mastery criterion. In sum, findings showed that partial alphabetic readers’ vocabulary learning benefitted from exposure to spellings of the vocabulary words.

While observing learning we noticed that students who had completed the spelling exposure condition first often commented on the lack of letters when they attempted to learn the number set taught second. Several students exclaimed, “Where are the letters?” as the page was turned during the first learning trial to reveal a number label, rather than the letters experienced previously. Often, students would say the numbers aloud, perhaps trying to make some connection to the names or characteristics of the animal. During most learning trials with spellings, students who did not remember the name upon first viewing the drawing alone would then shout out the name as soon as the page was flipped and letters were revealed. Several students asked for the page to be turned before answering or tried to turn the page themselves, seemingly because they knew the letters would provide assistance in remembering the name. One student even asked for the experimenter to wait to say the name so she could get credit for saying the name after the page was turned. Students completing learning with number labels first usually did not comment on the label, but would then point at or comment on the spellings when they were taught the second set of drawings. Most students expressed a general like for the set with spellings, regardless of whether the set involved learning animals or faces.

The main purpose of the study was to explore whether partial alphabetic phase children who were taught to segment words into phonemes with letters would be able to learn and remember new vocabulary words better when exposed to simple spellings of the words than
when exposed to number control symbols compared to control groups who received phoneme segmentation training without letters or who received no phoneme segmentation training.

Although students receiving phonemic awareness training with letters did better on invented spelling posttests, the type of phonemic awareness training they received had no significant effect on any of the vocabulary learning dependent measures. These results indicate that it was the viewing of the letters during vocabulary learning trials alone that accounted for the significantly faster learning and better memory seen at posttest. Orthography facilitated vocabulary learning, but phonemic segmentation made no additional contribution.

We also explored growth in word learning from trial to trial. While it was expected that students would remember the names better as they moved through the trials, we found a significant interaction between label type and trial. Students who saw spellings remembered the names of the drawings significantly better after the sixth trial than those seeing unrelated number pairs accompanying the drawings. In other words, the viewing of spellings facilitated word learning during later trials.

Several significant correlations also provided support for the mnemonic value of letters. Scores on invented spelling pretests and posttests were significantly correlated with trials to criterion and label memory measures that involved spelling exposure, but not on measures that involved number label exposure in the vocabulary learning tasks (See Table 7). This suggests that children who were better able to make the connections between letters and sounds were able to use this knowledge to improve their phonological memory for new vocabulary words.

Several significant correlations were also found between PPVT vocabulary scores and three posttest measures. Children with higher vocabulary scores needed fewer trials to learn new names in the number label condition and could identify more names when seeing the
accompanying spellings and could recall more features when hearing names. This supports the suggestion that students with higher vocabularies are more successful in learning the meanings of unknown words, perhaps because of a generally higher cognitive level among students with larger vocabularies.

**Phonemic Segmentation Training**

We hypothesized that preschoolers taught to segment words with letters would outperform those trained with shape markers and those who read a rhyming book on invented spelling tests. Students receiving phonemic segmentation training utilizing the game Mrs. Magic Mouth with letter markers, made significant gains from pretest to posttest while students receiving training with Mrs. Magic Mouth and unrelated shape markers or receiving rhyming training did not make any gains between pre and posttests. Letter trained students’ spellings contained more phonemically correct letters indicating they learned what they were taught.

The significant results obtained from phonemic segmentation training with letters support much previous research showing that letter name knowledge and phonemic segmentation skill with letters leads to faster progress and are important contributors in learning to read (Share et al., 1984; Juel et al., 1986; NICHD, 2000; NELP, 2008). The National Early Literacy Panel (2008) and the National Reading Panel (2000) all found evidence that letter knowledge, phonological awareness and phoneme segmentation ability measured at the start of kindergarten contribute strongly to later reading ability. Similarly, Roberts and Meiring (2006) found that early training in phonemic awareness and alphabetic coding produced superior outcomes on measures of word recognition.

Oudeans (2003) assessed children’s learning of letters and sounds within two sequences; a parallel non-integrated sequence and a parallel-integrated sequence. In the non-integrated
sequence children were taught letter names and sounds and then taught phonemic segmentation and blending at separate times during a lesson, while in the integrated sequence the teaching of letter names and sounds was immediately connected to training in blending and segmenting. Students were encouraged to move cards with letter labels as they segmented simple words, much like the “say it and move it” sequence developed by Elkonin (Ehri & Roberts, 2006). She found that the explicit connections made between letter sounds, phonological blending and segmenting in the parallel-integrated sequence helped children to significantly improve their skills. Similarly, we used the “say it and move it” sequence and found that instruction combining segmentation with letters led to significantly better results on invented spelling posttests, while segmentation with shapes and the rhyming condition produced no gains.

Yeh and Connell (2008) also gave preschoolers instruction in phoneme segmentation and blending that connected letters and sounds. Children in the phoneme segmentation group significantly outperformed those receiving instruction in either rhyming or vocabulary. Our findings endorse their suggestion that explicit instruction emphasizing phonemic awareness may be more likely to prevent reading difficulties especially among disadvantaged children as young as four years old.

Boyer and Ehri (2011) compared two phoneme segmentation conditions, one that used letters and mouth pictures and one that only used letters, to a no segmentation control condition. They found that segmentation training combining letters with articulation pictures was significantly superior to training with letters alone on an invented spelling task, and that both conditions utilizing letters were better than no training. Our results reiterate the value of utilizing letters during segmentation training and support their explanation that letters provide children with visible representations of phonemes and help to hold phonemic segments in memory.
Our results also support the findings of Ouellette and Senechal (2008). They taught three
groups of early kindergartners 13 letter-sound associations. An invented-spelling group was
encouraged to use the associations to spell target words phonetically. A phonological awareness
group was taught to match pictures of target words based on shared initial and final sounds and
were also taught to segment words based on Elkonin’s say-it and move-it activity using only
blank markers (Ehri & Roberts, 2006). A control group received the initial letter-sound training,
hearing the target words as the other groups had, but were encouraged to draw pictures of the
vocabulary words they heard. The invented spelling group was the only group that was taught to
manipulate letters in relation to sounds, similar to our phonemic segmentation with letters group.
Their invented spelling group performed significantly better on measures of invented spelling,
and the phonemic awareness group that used only blank markers to segment phonemes also
outperformed the drawing-only group on posttest measures of letter sounds and inventive
spelling.

**Orthographic Knowledge and Its Mnemonic Value for Vocabulary Learning**

The main purpose of our study was to examine the contribution of phonemic
segmentation training and orthography to the learning of new vocabulary words by children in
the partial alphabetic phase of reading. In this phase children are not yet reading but possess
linguistic competence with speech and have some ability to manipulate sounds in spoken words
(phonological awareness). They may also be able to recognize and name some letter shapes and
may begin to connect salient letters to the sounds they hear in language. As Ehri explains in the
identity amalgamation theory (1992, 2005), the remaining issue is how to incorporate printed
language into existing knowledge of spoken words. Partial alphabetic phase readers already
possess the phonological identities, the syntactic identities, and semantic identities of known
words. Orthographic identities, which are graphophonemic images, must merge with syntactic, semantic and phonological identities in memory so that printed words and letters represent them as well.

We hypothesized that students seeing spellings of new vocabulary words (character names) would learn the words in fewer trials, remember the names and features better, and would be able to better recognize letter labels when presented alone. Ehri and Wilce (1979), Rosenthal and Ehri (2008), Ricketts, Bishop and Nation (2009), Ricketts, Bishop, Pimperton and Nation (2011), and Chambre, Ehri and Ness (in press) worked with first and second graders who learned new vocabulary more quickly and remembered the words better when exposed to spellings of the words than when they only heard the words spoken. This previous research found support that orthography has mnemonic value among beginning readers and that the visual-phonological property of spellings is central to that effect. Exposure to spellings made it easier for first and second graders to store and remember the pronunciations of new vocabulary words. Our study lends support to the mnemonic value of orthography with younger children as our four and five year old children in the partial alphabetic phase were also able to learn new words significantly faster when seeing spellings accompanying drawings than when unrelated numbers were shown during learning trials.

While Rosenthal and Ehri (2008), Ricketts et al. (2009), and Ricketts et al., (2011) showed that viewing spellings boosted not only orthographic learning, but semantic learning as well, our results did not support the second assertion. Students viewing spellings during word learning did not recall more semantic features of the drawings than those viewing unrelated number labels at posttest or during trials. One possible reason for this may be that in the number exposure condition it took students, on average, more trials to learn the pronunciations of
character names to criterion than it took students in the spelling exposure condition. As a result, students in the number condition had more exposures to the drawings and heard the features repeated more times than those exposed to spellings. Perhaps this increased exposure hearing and seeing the features mitigated any difference favoring semantic feature learning in the spelling exposure group.

Similar to our results with four and five year old children, Chambre, Ehri and Ness (in press) found that first grade students with a mean age of 6.77 years learned pronunciations of words significantly better when spellings were seen, but did not recall semantic characteristics more readily. Studies working with children in second grade and above found evidence of improved semantic learning or recall of characteristics, while those working with younger students did not find evidence of better recall of semantic features (Chambre et al., and the current study.)

Ricketts et al. (2011) found an increase in orthographic and semantic learning in seven and eight year old children (mean age 8.25); however, semantic learning was assessed with a picture-matching task where students simply needed to choose which picture represented the new word. In our study children were asked to repeat features they had only heard during word learning trials and seen represented in the drawings. Perhaps slightly older children with full orthographic knowledge and stronger vocabularies are better able to utilize orthographic connections to more specifically assist in recalling semantic meanings better, while younger children with only partial knowledge are not yet able to process semantic information as fully. It would be interesting to study age and alphabetic reading phase to better understand the contributing factors that enable early readers to utilize orthographic information to recall semantic features of new words.
Strengths and Limitations

Although this experimental study employed a repeated measures design in word learning, the sample size utilized in each condition of phonemic awareness training was relatively small ($N=20$). While significant spelling improvement was shown in the phonemic segmentation with letters group, a larger sample size might support an interaction between phonemic awareness training and word learning. However, differences in mean performance between the training groups lent little confidence that a larger sample would yield an advantage to the letter trained group. (See Table 4.)

While over half of the students in this study were likely of lower income, they also exhibited above average ability in vocabulary and knowledge of letters and numerals. Establishing students as partial alphabetic phase readers was a main component of the design, and may not be possible in many preschools, especially where the teaching and viewing of letters is discouraged. Children that do not attend prekindergarten or who are not taught the names of alphabet letters and are not exposed to spellings and print on a regular basis are at a greater disadvantage considering the high expectations of today’s kindergarten classrooms.

Our sample was chosen from a variety of schools in a highly competitive urban setting and did not control for children’s previous home environment, teaching methods or related experiences. Even without direct teaching methods, children in New York City are exposed to a great deal of print and logographic information on a daily basis. Replicating this study with a different sample or in a rural or suburban setting, or with English language learners may not yield the same results. However, we were able to establish all participants as partial alphabetic phase readers, train and assess each child individually and to criterion in both phonemic awareness training and vocabulary word learning. All aspects of the experimental procedure
were completed by a single researcher with a great deal of experience working with preschool aged children. The use of the experimental repeated measures design also controlled for many possible inequalities in groups that were difficult to assess in previous studies.

The vast majority of children participating in this study thoroughly enjoyed all of the aspects of the procedure. They were eager to “play” the games with letters and eagerly accompanied the researcher to learn more names of new animals and faces. They appeared proud to show their letter, number and vocabulary knowledge and would delight in the names remembered after each set of learning trials. Most children smiled or laughed when being introduced to Mrs. Magic Mouth and eagerly began moving the laminated tokens into the Elkonin boxes, even without being encouraged to do so. It is our assertion that children of this age want to know more about letters and how they relate to sounds in words. They understand they will soon be expected to read and are excited by information and practice that helps them to begin to crack the alphabetic code. Several of the kindergarten students receiving whole language instruction in their classroom began to make better progress with just 15 minutes of instruction in phonemic segmentation, as reported by their classroom teachers. In this study we have shown that directly instructing children in letter/sound related activities does not have to be time consuming, boring or developmentally inappropriate; rather, it can be an enjoyable and absolutely necessary step to enable abilities that allow important reading skills to develop.

**Future Directions and Implications for Instruction**

Previous studies on orthographic facilitation of vocabulary learning conducted by this researcher yielded promising results. Both studies did not include segmentation training or utilize a repeated measures design. In the first study students remembered names significantly better when seeing letter labels than when viewing number labels. In the second study students recalled
names significantly better when seeing the accompanying letter label at posttest than when viewing number labels. Remembering names and the number of learning trials needed to reach criterion also showed favorable results in the second study when students viewed spellings, with large effect sizes in each case. In the pilot study that taught all children to segment CV words, preschool students in the spelling vocabulary word learning condition were significantly better able to remember the names of drawings, and remember the pronunciations of words when viewing spellings at posttest. Results approached significance for the number of trials needed to reach criterion.

In the future, we would like to further explore how partial alphabetic phase readers use orthography to better remember words and semantic features. We would also like to explore the most interesting and effective ways to provide phonemic awareness training to partial alphabetic phase readers, and explore how that training may better contribute to children’s future reading success. Extensions of this study should consider including CVC words in segmentation training to see if this could further assist the invented spelling of CVC words. An invented spelling posttest that is administered after the completion of the vocabulary word learning trials could also be added to ascertain if students remembered the training received in the phonemic awareness segmentation training and could utilize it to spell the new vocabulary words learned. Researchers could also ask students to segment or inventively spell some new, longer words not included in the trainings to see if students could transfer their ability to spell more complex words with different letters. Similar posttests could also be given after a period of several days or a week to see if the mnemonic value of spellings persisted.

We would like to utilize the results of this study and others like it to help create interesting and developmentally appropriate curricular activities for prekindergarten and
kindergarten classrooms that will assist students in learning letters, isolating phonemes and learning grapheme-phoneme connections. The mnemonic value of orthography needs to be incorporated into vocabulary instruction at all levels, including prekindergarten. Teachers of very young children need to be better trained to understand and assess phonemic awareness skills in young children and how to utilize activities that prepare students for their upcoming challenges, while maintaining a child centered, play-based environment. Instead of viewing instruction of letters and phonemic segmentation as pushing children to do something they are not ready for, we can instead build on children’s existing knowledge and provide scaffolds to abilities that are clearly within their reach, regardless of socioeconomic or ethnic background. Rather than perpetuating the pervasive notion that teaching of skills associated with later reading success is difficult, boring or inappropriate for young children, we need to begin to adopt the techniques and games included in this, and other recent studies in order to translate this evidence into real classroom practice.

Currently, the Universal Prekindergarten program in New York City does not recommend instruction in specific letter/sound correspondences, yet the NYS Common Core Aligned Standards for Prekindergarten appear to have much higher expectations. While some curricular approaches may agree that the direct instruction of letters or phonemic segmentation is necessary, there appears to be little evidence of these techniques in practice. By the end of the prekindergarten year students should be able to demonstrate an awareness of the relationship between sounds and letters, isolate and pronounce the initial sounds in words and demonstrate emergent phonics and word analysis skills, including one-to-one letter-sound correspondences (New York State Pre-Kindergarten Foundation for the Common Core Standards, 2011).

Currently, children may be exposed to letters within story reading or literacy activities, but even
the knowledge and discussion of letter names or sounds is not specifically recommended as part of the most prekindergarten curricula. Once children enter kindergarten, however, they are expected to jump from little or no knowledge of letter names and corresponding sounds to reading and writing independently in only a few months. This seems an unrealistic expectation.

The National Early Literacy Panel (2008) explains that children entering kindergarten and first grade vary greatly in their attainment of the early precursor skills that provide the launching pad for later literacy learning. Results of their meta-analysis suggest that conventional reading and writing skills that are developed in the years from birth to age five have a clear and consistently strong relationship with later conventional literacy skills. They discuss the six variables that showed medium to large predictive relationships with later measures of literacy development even when the variables of intelligence and socioeconomic background are accounted for. The variables included alphabet knowledge, phonological awareness, rapid automatic naming of letters or digits and of objects or colors, writing letters and phonological memory.

Results of this study show that prekindergarten students who receive simple segmentation training utilize grapheme-phoneme connections to assist in the memory of new words. Many prekindergarten educators believe that four and five year old students are not developmentally ready to connect letters and sounds, and the direct teaching of this skill in discouraged. However, we believe that by building on children’s letter name knowledge and providing systematic but enjoyable instruction and segmentation training, children will begin to understand the connections made in words and will begin to transfer that learning into reading simple words. By understanding the beginnings of the alphabetic code that supports words and reading, children will be able to remember new words better when provided with letters to connect to
sounds.

This research addresses the high expectations made of today’s Kindergartners by exploring many of the component skills recommended by the National Early Literacy Panel (2008) as predictors of reading success. While some educators believe that prekindergarten students may not be developmentally ready for the introduction of letter names, phonemic segmentation and grapheme-phoneme correspondences, we have shown that the introduction of these skills is not only developmentally appropriate, but necessary to ensure children are prepared with tools to master the alphabetic code and experience reading success in kindergarten and beyond.
# Appendix A

Data Collection Sheet

<table>
<thead>
<tr>
<th>Letter name</th>
<th>Number test</th>
<th>Word reading</th>
<th>Non word decoding</th>
<th>Invented Spelling BIT (bite) model</th>
<th>Segment</th>
<th>D.O.B.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B</td>
<td>2</td>
<td>AT</td>
<td>RI</td>
<td>TIM time</td>
<td>PA</td>
<td>TI</td>
</tr>
<tr>
<td>O S</td>
<td>8</td>
<td>BALL</td>
<td>SU</td>
<td>ROD road</td>
<td>DU</td>
<td>SO</td>
</tr>
<tr>
<td>T P</td>
<td>4</td>
<td>SEE</td>
<td>LE</td>
<td>SUP soup</td>
<td>LI</td>
<td>BU</td>
</tr>
<tr>
<td>E M</td>
<td>0</td>
<td>RED</td>
<td>BO</td>
<td>BAT bait</td>
<td>TO</td>
<td>FI</td>
</tr>
<tr>
<td>U D</td>
<td>3</td>
<td>UP</td>
<td>JAT</td>
<td>FIR (fire)</td>
<td>ME</td>
<td>RE</td>
</tr>
<tr>
<td>R I</td>
<td>7</td>
<td>TO</td>
<td>DIB</td>
<td>LED lead</td>
<td>RA</td>
<td>LA</td>
</tr>
<tr>
<td>L J</td>
<td>1</td>
<td>DID</td>
<td>POJ</td>
<td>JAL jail</td>
<td>SU</td>
<td>TU</td>
</tr>
<tr>
<td>F C</td>
<td>5</td>
<td>FOR</td>
<td>MUR</td>
<td>FUD food</td>
<td>LO</td>
<td>PI</td>
</tr>
<tr>
<td>Z K</td>
<td>6</td>
<td>ME</td>
<td>TEF</td>
<td>MOR more</td>
<td>MI</td>
<td>FO</td>
</tr>
<tr>
<td>N Q</td>
<td>9</td>
<td>GO</td>
<td>FAP</td>
<td>PAD paid</td>
<td>SA</td>
<td>JA</td>
</tr>
<tr>
<td>V X</td>
<td></td>
<td></td>
<td></td>
<td>DO</td>
<td>BI</td>
<td></td>
</tr>
<tr>
<td>G W</td>
<td></td>
<td></td>
<td></td>
<td>MU</td>
<td>RO</td>
<td></td>
</tr>
<tr>
<td>Y H</td>
<td></td>
<td></td>
<td></td>
<td>RI</td>
<td>FU</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FA</td>
<td>MA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LE</td>
<td>JO</td>
<td></td>
</tr>
<tr>
<td>Invented Spelling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIT (bite) model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIM time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROD road</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUP soup</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAT bait</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIRE fire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED lead</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JAL jail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUD food</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOR more</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PAD paid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Word Learning condition**

1. Animal letter/ face number  
2. Animal number/ face letter

3. Face letter/ animal number  
4. Face number/ animal letter
<table>
<thead>
<tr>
<th>Word Learning Trial 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

Post test 1
1. remember names with drawings
2. see label/ remember name
3. names spoken/ characteristics
<table>
<thead>
<tr>
<th>Word Learning Trial 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>13</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>16</td>
</tr>
<tr>
<td>17</td>
</tr>
<tr>
<td>18</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>Post test 2</td>
</tr>
<tr>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>1. remember names with drawings</td>
</tr>
<tr>
<td>2. see label/ remember name</td>
</tr>
<tr>
<td>3. names spoken/ characteristics</td>
</tr>
</tbody>
</table>
Appendix B

Scripts

**PRETESTS**

1. **Introduction/ oral assent**

Obtain child’s consent at the start of the pretest session.

“Hi, (Child’s Name) My name is Robin. Would you like to play some games with me today?

First you can show me how many letters and numbers you know and then we will play some other games with words and pictures. Your parents (Mom and/ or Dad) said it was OK for you to work with me, but it’s up to you. We can stay in the classroom today if you would like. Is that OK with you?”

2a. **Letter Identification**

**Need:** Letter flip chart index cards

**Introduction**

“First we’re going to see how many letter names you know. If you don’t know all the names it’s OK. Just do your best. Do you know the name of this letter?” (Show the letter A – first letter on the flip chart)

*Child answers*

“Great. How about this letter?” (turn the page to show the next letter)

*Child answers*

“Do you know this letter?” (Continue to each of 26 letters.)

Record each letter named correctly on the score sheet. Letters utilized in the study are the first 15 letters of the flip chart. If the child does not know the first 15 letters on the list, end the session.

2b. **Number Recognition**
**Need:** Number flip chart index cards

**Introduction**

“Next, let’s see how many numbers you know. If you don’t know it’s OK, just do your best.

Do you know the name of this number?” (Show ‘2’ – the first number on the flip chart)

*Child answers*

“Great. Do you know this number? (turn the page to show the next number)

*Child answers*

“How about this number?” (Continue to each of 10 single digit numbers)

Record each numeral named correctly on the score sheet. If a child does not know at least 6 numerals, end the session.

**3a. Word reading**

**Need:** Word reading flip chart index cards

**Introduction**

“Now I’m going to show you some words and see if you know how to read them. It’s OK if you don’t know how. Most kids your age don’t know how to read yet, but if you do – just tell me what you see.” (Show the first word)

*Child answers*

(Record the answer on the score sheet. Continue to show two more words.)

*Child answers*

(Record the answer on the score sheet. If the child has answered correctly, show the full list of 10 words. Record what the child says.)

**3b. Non-word Decoding**

**Need:** Non-word flip chart index cards
Introduction

“Here are some different words. These are made-up words. They aren’t real words. Can you tell me how we might say them?” (Show the first non-word on the flip chart)

Child answers

Record any attempts on the score sheet. Show 2 more words and record answers on the data sheet

Child answers

(If children decode correctly, show all the cards and record results. If a child is decoding nonwords correctly, they are not considered partial alphabetic phase readers and the session can be terminated.)

*If children seem frustrated or tired, the next task can happen on a subsequent day.

4. Invented Spelling Pretest


Introduction

“Now we will try to spell some words. Here are some letters you know. I’m going to say some words and your job is to pick letters for the sounds in the words. You just move the letters down here on this line.” (Lay out all the letter tiles above 3 connected boxes)

“Let me show you how. Bite. I can spell it with these letters, bite, /b/, /i/, /t/.” (Place the letter B first, then the letter I, then the letter T on the line.)

“OK, now it’s your turn. All of the words have three letters. You say the sounds and pick letters for those sounds. Move them down to this line.”

Routine

“The word is ______. (Say the word very slowly)
“You say it. Then say the sounds and move the letters down.”

(Child says word, moves letters.)

“Good try.”

(Give one point for correct letter placed on line. Continue with the following words in order:
Time (TIM), Road (ROD), Soup (SUP), Bait (BAT), Fire (FIR), Lead (LED), Jail (JAL), Food (FOD), More (MOR), and Paid (PAD). Record any correct letters on the score sheet.)

Vocabulary (Fit into schedule on any day)

Need: Peabody Picture Vocabulary Test-4, Form B (PPVT-4; Dunn & Dunn, 2007).

Introduction

(Follow the procedure recommended by the PPVT-4.)

PROCEDURE - Phonemic Awareness Training

Oral assent: segmentation/phonological awareness conditions

“Since you did such a great job last time, I’d like to play another game with you called Mrs. Magic Mouth (show drawing). She has sounds in her mouth that you can see! Would you like to do this? We can stay in the classroom or walk down the hall a bit so it is quieter.”

1a. Phoneme Segmentation Training – letter condition


Introduction

“Today we are going to play a game called Mrs. Magic Mouth. She has sounds in her mouth that you can see! She’s going to say some words and we are going to listen for the sounds and move
the letters to these boxes. You have to listen very carefully to make sure you hear all the sounds
in the word. I’ll show you.

---------

Mrs. Magic Mouth says PA.

I hear two sounds in PA /p/, /aa/.

You say PA, /p/ /aa/.

Now I’m going to pick a letter for each sound and move it into its sound box.

PA, /p/ (point to letter as you say its sound, move the P tile into the left box),

    /aa/ (point to letter as you say sound, move the A tile into the right box.)

This says PA

(Move letters back into mouth.)

“Now you say PA, then say each sound and move that letter into a sound box.”

Child repeats Correct if necessary

Routine

“Mrs. Magic Mouth says _____.

“You say ____ and then say the two sounds in _____. (Child R)

(Correct if necessary: MO, /m/, /oo/

“Now say each sound in ____ and move a letter into its sound box.

(Correct if necessary: “Watch me. ______ /x/ /xx/

(Move letters back into mouth)

“Okay you do it just like I did.”

(Child repeats. Correct if necessary.)

“Let’s try another one.
VOCABULARY LEARNING IN PRESCHOOLERS

Word order: PA, DU, LI, TO, ME, RA, SU, LO, MI, SA, DO, MU, RI, FA, LE, TI, SO, BU, FI, RE, LA, TU, FO, JA, BI, RO, FU, MA, JO, PI.

Record the correct sound segments and correct letters in each box for spellings of pseudowords. Students must complete five consecutive words correctly without assistance.

1b. Phoneme Segmentation Training – shape condition

Need: Mrs. Magic Mouth poster. 15 shape tiles.

Introduction

“Today we are going to play a game called Mrs. Magic Mouth. She has sounds in her mouth that you can see! She’s going to say some words and we are going to listen for the sounds and move the markers to these boxes. You have to listen very carefully to make sure you hear all the sounds in the word. I’ll show you. Mrs. Magic Mouth says BE. Now you say it. Child answers, ‘BE’. Buh /b/ (move a shape tile into the left box) Eee /e/ (move a shape tile into the right box.) Together we have BE.” (trace a line under the two boxes with your finger as you say the word again.) “BE.”

“Let’s try another one. Mrs Magic Mouth says pay. Pay. Now you say it.”

Child says Pay.

(Allow the child to choose tiles. If children have difficulty beginning say, “/p/, /a/, Pay. Choose a shape to mark /p/. Now chose one for /a/.” Provide as much feedback as the child needs with each word.)

As the child begins to choose tiles and repeat the procedure, lessen the amount of feedback given. Word order: BE, PA, DU, LI, TO, ME, RA, SU, LO, MI, SA, TE, DO, MU, RI, FA, LE, TI, SO, BU, FI, RE, LA, TU, FO, JA, SE, BI, RO, FU, MA, JO, PI. Students must complete five trials correct without assistance.
1c. Rhyming control condition

Oral assent

“Since you did such a great job last time, I’d like to read a rhyming book to you (show book).

This book is called *Hop on Pop*, by Dr. Seuss. Would you like me to read this book to you?”

Need: *Hop on Pop* by Dr. Seuss. Paper, crayons or markers, sentence strips.

Introduction

“I’m going to read this book to you. (show book) I want you to listen for words that rhyme in
this book. Do you know what rhyming words are?”

Child answers

“Rhymes are words that sound the same at the end, but have a different sound at the beginning.
Like Hop and Pop, Cup and Up, and Mouse and House.” (Point to these words in the text)
(Read the text)

“Now I’d like you to draw your favorite part of the story and we’ll see if we can think of any
words that rhyme.”
(Allow the child to draw a picture, ask them what they drew and write their description on a
sentence strip to accompany the drawing. Talk together about any words that might rhyme in
their description or the favorite section of the book. Record what the child says.)

POSTTEST Invented Spellings


Introduction

“Now we will try to spell some words. Here are some letters you know. I’m going to say some
words and your job is to pick letters for the sounds in the words. You just move the letters down
here on this line.” (Lay out all the letter tiles above 3 connected boxes)
“Let me show you how. Bite. I can spell it with these letters, bite, /b/, /i/, /t/.” (Place the letter B first, then the letter I, then the letter T on the line.)

“OK, now it’s your turn. All of the words have three letters. You say the sounds and pick letters for those sounds. Move them down to this line.”

Routine

“The word is ______. (Say the word very slowly)

“You say it. Then say the sounds and move the letters down.”

(Child says word, moves letters.)

“Good try.”

(Give one point for correct letter placed on line. Continue with the following words in order: Time (TIM), Road (ROD), Soup (SUP), Bait (BAT), Fire (FIR), Lead (LED), Jail (JAL), Food (FOD), More (MOR), and Paid (PAD). Record any correct letters on the score sheet.)

2. PROCEDURE - Vocabulary Learning Task

Oral assent

“Now that you have learned so much, I would like to play another game with you. In this game I will show you animals and faces that have something special about them. I’ll tell you their new name and you will try to remember it. (Show the first page from the book) It might take a couple of tries to remember all of the names, but you can have as many tries as you need. We will go to a quieter spot so you can concentrate. Would you like to try this game?”

2a Animal condition (spellings and number labels):

Need: Animal condition book- appropriate letter or number labels for counterbalanced condition.

Introduction:
“Here are some animals you may recognize. Each animal has something different that makes it special, so it has been given a new name. I will show you five animals and you will try to remember their names. Ready?”

**Study Trial**

Show each animal with accompanying label in the first order it appears. Do not draw any attention to the label accompanying the drawings.

“Lu, a cat with many polka dots is named Lu.”

“Mo, a dinosaur wearing sneakers is named Mo.”

“Ji, a squirrel wearing glasses is named Ji.”

“Fe, a pig with wings is named Fe.”

“Ba, a dog with a really long tail is named Ba.”

**Learning Trials**

Go back to the first page. Show each animal without the label first

“Do you remember this name?”

*Child answers or is silent.* (wait 5 seconds, then turn the page to reveal the same drawing with label)

“Lu, a cat with many polka dots is named Lu.”

*Child says “Lu.”* If the child does not say “Lu” say, “You say it, Lu.”

*Child says “Lu.”*

Show the next page. “Do you remember this name?”

*Child answers or is silent* (wait 5 seconds, then turn the page to reveal the same drawing with label)

“Mo, a dinosaur wearing sneakers is named Mo.”
Child says “Mo.” If the child does not say “Mo” say, “You say it, Mo.”

Child says “Mo.”

Show the next page. “Do you remember this name?”

Child answers or is silent (wait 5 seconds, then turn the page to reveal the same drawing with label)

“Ji, a squirrel wearing glasses is named Ji.”

Child says ‘Ji.’” If the child does not say “Ji” say. “You say it, Ji.”

Child says “Ji.”

Continue through the following drawings in the book. There are five trials in each book in random predetermined order. Record every guess on the score sheet. If the child remembers the name, simply check the word.

After the 3rd full trial stop.

“Now I’m going to say the names and see if you can remember what is special about each one.

Lu. Do you remember what is special about Lu?” give 5 seconds and write any answers given.

“How about Mo? Do you remember what was special about Mo?” write anything said

“Ji. What made Ji special?” write any answer

“Fe. What was special about Fe?” write answer

“Ba. What made Ba special?” write answer

Resume the word learning trials with the fourth trial

Criterion for learning is all 5 names remembered two times consecutively.

If the child needs more than 5 trials to reach criterion, they may continue through the book again from the beginning.
Stop after every 3rd trial (3rd, 6th, 9th, 12th, 15th, 18th) to ask if the child remembers the characteristics of the drawings.

If the child is tired or does not want to continue at any time, they may resume trials later or the next day.

Be very sure not to draw any attention to the labels accompanying the drawings. If children comment about the letter or number labels, simply nod, say yes, or ignore their comments.

2b Faces condition (spelling and number labels):

Oral assent

“Now that you have learned so much, I would like to play another game with you. In this game I will show you animals and faces that have something special about them. I’ll tell you their new name and you will try to remember it. (Show the first page from the book) It might take a couple of tries to remember all of the names, but you can have as many tries as you need. We will go to a quieter spot so you can concentrate. Would you like to try this game?”

Need: Faces condition book- appropriate letter or number labels for counterbalanced condition.

Introduction:

“Here are some faces of people. Each face has something different that makes it special and each person has a name. I will show you five faces and you will try to remember their names. Ready?”

Study Trial

Show each face with accompanying label in the first order it appears. Do not draw any attention to the label accompanying the drawings.

“Ta, a girl with brown curly hair is named Ta.”

“Po, a boy with brown hair and freckles is named Po.”
“Si, a man with no hair and a beard is named Si.”

“Ru, a girl with red hair and green eyes is named Ru.”

“De, a lady with blonde hair and glasses is named De.”

**Learning Trials**

Go back to the first page. Show each face without the label first

“Do you remember this name?”

Child answers or is silent. (wait 5 seconds, then turn the page to reveal the same drawing with label)

“Ta, a girl with curly brown hair is named Ta.”

*Child says “Ta.”* If the child does not say “Ta” say, “You say it, Ta.”

*Child says “Ta.”*

Show the next page. “Do you remember this name?”

*Child answers or is silent* (wait 5 seconds, then turn the page to reveal the same drawing with label)

“Po, a boy with brown hair and freckles is named Po.”

*Child says “Po.”* If the child does not say “Po” say, “You say it, Po.”

*Child says “Po.”*

Show the next page. “Do you remember this name?”

*Child answers or is silent* (wait 5 seconds, then turn the page to reveal the same drawing with label)

“Si, a man with no hair and a beard is named Si.”

*Child says ‘Si.’* If the child does not say “Si” say. “You say it, Si.”

Child says “Si.”
Continue through 5 trials in the book in random predetermined order. Record every guess on the score sheet. If the child remembers the name, simply check the word.

Criterion for learning is all 5 names remembered two times consecutively.

If the child needs more than 5 trials to reach criterion, they may continue through the book again from the beginning. If the child is tired or does not want to continue at any time, they may resume trials later or the next day.

After the 3rd full trial stop.

“Now I’m going to say the names and see if you can remember what is special about each one. Ta. Do you remember what is special about Ta?” give 5 seconds and write any answers given.

“How about Po? Do you remember what was special about Mo?” write anything said

“Si. What made Si special?” write any answer

“Ru. What was special about Ru?” write answer

“De. What made De special?” write answer

Resume the word learning trials with the fourth trial

Criterion for learning is all 5 names remembered two times consecutively.

If the child needs more than 5 trials to reach criterion, they may continue through the book again from the beginning.

Stop after every 3rd trial (3rd, 6th, 9th, 12th, 15th, 18th) to ask if the child remembers the characteristics of the drawings.

If the child is tired or does not want to continue at any time, they may resume trials later or the next day.

Be very sure not to draw any attention to the labels accompanying the drawings. If children comment about the letter or number labels, simply nod, say yes, or ignore their comments.
POSTTESTS

Oral assent:

“This time we will look at the animals (or faces) one last time and you can tell me everything you remember. If you don’t remember anything, it’s OK – just do the best you can. Would you like to show me what you remember?”

1. Recalling Names of Drawings

Need: Posttest booklet with drawings of animals and faces without labels.

Introduction:

“Here are the (animal or faces) drawings again. Let’s see how many names you remember.

Do you remember this name?” (Show the first drawing)

Child answers (record the answer on the score sheet)

“How about this one?” (Show the second drawing)

Child answers (record the answer on the score sheet)

Show all five drawings in the first study trial order with no labels present. Record all answers and information on the score sheet.

2. Recalling Names Associated with Labels

Need: Posttest booklet with labels (letter or number). No pictures will be present.

Introduction:

“Do you remember that there were some letters (or numbers) on some of the drawings? Now I’m going to show you those letters (or numbers) and you try to remember the name of the animal (face) for those letters (numbers).”

Show the first label – depending on counterbalanced condition. (TA, 35, LU, 18)

“Do you remember which animal (or face) this was written on?”
Child answers (write down any information on the score sheet)

Show the second label – depending on counterbalanced condition. (PO, 28, MO, 93)

“Do you remember which animal (or face) this was written on?”

Child answers (write down any information on the score sheet)

Show the third label, continue. Record any responses on the score sheet.

3. Recalling the Features of Drawings

Need: Score sheet

Introduction: “Now I’m going to say the names of the animals (faces) and you try to remember what was special about them.”

“The first one is FE (or RU.) What was special about FE (RU)?”

Child answers. Each drawing has 2 characteristics. Write down anything the child says.

“Next is BA (or DE.) What was special about BA (DE)?”

Child answers.

Continue on in the order of JI, MO and LU – or SI, PO and TA. Record the number of characteristics remembered and any information the children discuss.
Appendix C
Parental Permission

CITY UNIVERSITY OF NEW YORK

Graduate Center
Department of Educational Psychology

PARENTAL/LEGAL GUARDIAN PERMISSION FORM
AND AUTHORIZATION FOR
CHILD’S PARTICIPATION IN RESEARCH

Project Title: Do Spellings of Words and Phoneme Segmentation Training Facilitate Vocabulary Learning in Preschoolers?

Principal Investigator: Robin O’Leary
Doctoral Candidate
The Graduate Center, City University of New York
365 Fifth Avenue, Room 3203
New York, NY, 10016
646-221-4331
r.oleary@rcn.com

Faculty Advisor: Linnea C. Ehri
Distinguished Professor
Graduate Center, City University of New York
365 Fifth Avenue, Room 3204.01
212-817-8294
lehri@gc.cuny.edu

Sites where study is to be conducted: Hunter College (CUNY) Early Learning Center
The Graduate Center CUNY, Child Development and Learning Center
Borough of Manhattan Community College Learning Center

Introduction/Purpose: Your child is invited to participate in a research study. The study is conducted under the direction of Robin O’Leary, a doctoral student at The Graduate Center of the City University of New York. The purpose of this research study is to better understand how preschool children begin to read and remember new information. The results of this study may improve our teaching methods for young children and will help us understand early reading processes better.

Procedures: Approximately 50 individuals are expected to participate in this study. Each child will participate in a series of games and lessons involving letters, numbers and new names. The time commitment of each participant is expected to be about six 10-15 minute sessions over the span of two weeks during the regular school day.

Possible Discomforts and Risks: There is no greater risk than typical activities in prekindergarten classrooms. Your child will be asked before each session if they would like to work with, and continue to work with the researcher, Robin O’Leary. In similar previous studies, children have asked to play the
learning games again, even after the research portion had been completed. However, if your child feels stressed or uncomfortable in any way, please contact Robin O’Leary at the above listed number or email.

**Benefits:** This research will give us a clearer understanding of how children process sounds and letters while in the beginning phases of learning to read. Participation in this study may also improve your child’s understanding of letters, sounds and how they are combined in words.

**Voluntary Participation:** Your child’s participation in this study is voluntary, and you may decide to withdraw your child from participation without prejudice, penalty, or loss of benefits to which you are otherwise entitled. If you decide to remove your child from the study, please contact the principal investigator, Robin O’Leary to inform them of your decision.

**Confidentiality:** The information obtained from your child will be collected via written forms completed by the researcher. No children will be identified by name and the researcher will protect your child’s confidentiality by coding all data by number in computer files and storing the consent forms separately in a securely locked cabinet. The collected data will be accessible to Robin O’Leary, Linnea Ehri and the CUNY Institutional Review Board (IRB) members only.

**Contact Questions/Persons:** If you (or your child) have any questions about the research now or in the future, you should contact the Principal Investigator, Robin O’Leary, 646-221-4331, r.oleary@rcn.com. If you have questions about your rights as a research participant, or you have comments or concerns that you would like to discuss with someone other than the researchers, please call the CUNY Research Compliance Administrator at 646-664-8918. Alternately, you can write to:

CUNY Office of the Vice Chancellor for Research Attn: Research Compliance Administrator 205 East 42nd Street New York, NY 10017

**Statement of Consent:**

“I have read the above description of this research and I understand it. I have been informed of the risks and benefits involved, and all my questions have been answered to my satisfaction. Furthermore, I have been assured that any future questions that I may have will also be answered by the principal investigator of the research study. I voluntarily agree to allow my child to participate in this study. By signing this form I have not waived any of my legal rights to which my child would otherwise be entitled. I will be given a copy of this statement.”

Printed Name of Child

______________________________
Printed Name of Child

______________________________
Signature of Subject’s Legal Guardian

______________________________
Date Signed

______________________________
Printed Name of Person Explaining Form

______________________________
Signature of Person Explaining Form

______________________________
Date Signed

______________________________
Printed Name of Investigator

______________________________
Signature of Investigator

______________________________
Date Signed
Appendix D

Child’s Oral Assent

Script for obtaining a child’s oral assent prior to the study:

Initial meeting:

“Would you like to play some games with me today? First you can show me how many letters and numbers you know and then I will show you some pictures and you can tell me what you see. Your parents (Mom or Dad) said it was OK for you to work with me, but it’s up to you. We can stay in the classroom today if you would like. Is that OK with you?”

After pretesting is completed: (2nd meeting)

“Since you did such a great job last time, I’d like to play another game with you called Mrs. Magic Mouth (show drawing). She has sounds in her mouth that you can see! Would you like to do this? We can stay in the classroom or walk down the hall a bit so it is quieter.”

After segmentation training: (3rd meeting)

“Now that you have learned so much about letters and sounds, I would like to play another game about these drawings. I will show you animals and faces that have something special about them and you will try to remember what their new name is. (Show a page from the book – Dinosaur with Sneakers) It might take a couple of tries to remember all of them, but you just have to do your best. We will go to a quieter spot so we can concentrate. Would you like to try this game?

For post testing:

“This time we will look at the animals (or faces) one last time and you can tell me everything you remember. If you don’t remember anything, it’s OK – just tell me what you do remember. Would you like to show me what you remember?”
Appendix E
Cover Letter for Parents

Dear Parent or Guardian,

My name is Robin O’Leary and I am a doctoral student enrolled in the Educational Psychology Department at the Graduate Center of the City University of New York. I would like to invite your child to participate in a study that will explore the connections children make when they first begin to understand letters and sounds on their way to reading. I was awarded the Jeanne S. Chall Research Fellowship for the proposal of this study by the International Reading Association, so I hope to make a significant contribution to the field of early childhood education with this work.

In this study each child will meet with me for 7 or 8 short sessions, no more than 15 minutes at a time. We will play a series of games where I will first see if your child knows some alphabet letter names, but is not yet reading. I will check their vocabulary skills with a popular picture vocabulary test that is often used with young children. In another session we will play a game listening to sounds in words called Mrs. Magic Mouth. Finally, I will show your child some drawings with fun new characteristics (for example, a dinosaur wearing red sneakers). The drawings will have “new” names and your child will try to remember the words.

There is no known risk to your child in participating in this study, and most children enjoy playing the games and ask to play again. Some children may learn how to connect sounds and letters more effectively, which is known to be an important step in learning to read. Participation is voluntary and you or your child can decide not to participate at any time.

My research involves the connections most young learners can make and is not focused on the ability or results of any one particular child. No names of children or schools will be included with any data or in the reporting of results. Your child’s individual ability is not being tested and will not be discussed with any teacher, director, principal or school system. If you have any more questions about my research, you can contact me at r.oleary@rcn.com or call me at (646) 221-4331. You may also contact the CUNY Graduate Center’s Institutional Review Board at (646) 664-8918.

Two copies of the Parent Permission Form are attached. If you would like your child to participate, please read the official form and keep one copy for yourself. Sign one copy and return it to the school as soon as possible.

Sincerely,

Robin O’Leary
References


CUNY Office of Institutional Research. Student Profile/ Demographic Information. Retrieved April 22, 2017 from http://www2.cuny.edu/about/administration/offices/oira/institutional


vocabulary learning in monolinguals and language minority English-speaking college students. *Journal of College Reading and Learning, 46*(2), 99 – 112.

doi:10.1080/10790195.2015.1125818


