The effects of blending and segmenting decoding strategies on reading

Kristin Hall

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The Effects of Blending and Segmenting Decoding Strategies on Reading

By

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Abstract

This study investigated the effects of a reading intervention that integrated blending and segmenting decoding strategies on the word recognition performance of five first grade students who were considered below grade level expectations set by the school district. The intervention evaluated students’ abilities to decode short vowel closed syllable words with digraphs through blending and segmenting phonemes. Six assessments were used to analyze the effects of the decoding performance of the five students. All students demonstrated significant gains in their ability to decode short vowels and digraphs, and segment phonemes. Students also increased their accuracy when reading words in isolation, and spelling words. The effects suggest the impact of incorporating blending and segmenting strategies when designing an intervention for students reading below grade level expectations.
# Effects of Blending and Segmenting Strategies

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CHAPTER ONE: INTRODUCTION

With the expectation that students are reading to comprehend, students can only comprehend once they have accurately read the text. For students to read text accurately, they must have a solid foundation of understanding how to decode or recognize words. Readers translate the printed word into speech, whether they are reading orally or silently. When the reader comes to an unknown word on the page, they must do one of three things. The reader will determine the unknown word by using context clues, know the word from immediate recognition, or analyze the word by applying letter-sound correspondences to pronounce the written word (Henry, 1993). Students who struggle with learning to read at the end of first grade are more likely to experience continued academic challenges (McIntosh, Horner, Chard, Boland, & Good, 2006). Likewise, a substantial number of students enter and exit Kindergarten at risk of not acquiring basic literacy skills (Foster & Miller, 2007). With the importance of word recognition on the impact of all of reading abilities, students in the early grades must receive explicit instruction in word recognition. Decoding skills and word recognition strategies must be included in reading instruction in Kindergarten and first grade classrooms so students are able to build strong word attack skills as a foundation for all of their reading skills. Teachers must be prepared to effectively instruct students in decoding words and matching letters to sound, especially in Kindergarten and first grade, to prevent poor readers continuing to struggle through school.

Another reason why students need to learn how to decode words accurately is due to the adoption of the Common Core State Standards by forty-two of the fifty states. The standards provide a consistent, clear understanding of what students are expected to learn at each grade level so teachers can plan instruction to meet the standards. The Common Core English
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Language Arts Standards for Foundational Skills in Reading state that students in Kindergarten through fifth grade must know and apply grade level phonics and word analysis skills in decoding words (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). Furthermore, students in Kindergarten and first grade are expected to demonstrate an understanding of spoken words, syllables, and sounds as stated by the subsection of Phonological Awareness Standards under the Foundational Skills of Reading Standards (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). For example, in first grade students must know spelling-sound correspondences, distinguish sound differences for the same letter, orally produce words by blending sounds, isolate and pronounce all sounds, segment words into individual sounds, and decode regularly spelled words. To blend sounds, students must combine individual sounds to form a word (Vukelich, Christie, & Enz, 2012). Segmenting words is the opposite of blending where students break up words into individual sounds (McGee, 2007). As students progress through school, the phonics and word analysis skills for decoding words increases in difficulty to match grade level expectations.

Rationale

Educators must use the Common Core English Language Arts Standards as a guide to prepare their students to know and accurately apply grade level phonics and word analysis skills to decode words. For students to learn to convert graphemes to phonemes, the ability to perceive, segment, and explicitly manipulate the sounds of spoken words is required. Graphemes are the printed symbol, and phonemes are the individual sounds in the printed word. This ability is referred to as phonological awareness, which requires the full awareness of the phonological structure of speech (Gombert, 1992; Stuart, 2005). Phonological awareness is an expansive term which refers to the awareness of the sound structure of speech (Vukelich, Christie, & Enz, 2012).
Phonological awareness is essential to the acquisition of reading skills (Ellis, 1990). Decoding skills and word recognition strategies incorporating phonological awareness must be included in reading instruction in Kindergarten and first grade classrooms so students are able to build strong word attack skills as a foundation for all of their reading skills. Teachers must be prepared to effectively instruct students in decoding words to prevent poor readers continuing to struggle through school.

**Research Questions**

Beginning in Kindergarten and through fifth grade, students need to know and apply grade level phonics and word analysis skills to decode words. Based on the expectations defined in the Common Core State Standards for English Language Arts, the researcher of this study framed questions surrounding students’ decoding abilities. What effect does word recognition have on reading performance? What effect does phonological awareness have on decoding? What effect does blending and segmenting have on a student’s ability to decode? The Common Core State Standards and the three questions guided the design and implementation of this study.

**Methodology**

The researcher focused on teaching phoneme blending and segmenting skills to assist students in decoding words. An emphasis on phonological awareness was also included in the instruction to aide students with decoding. Five first grade students participated in the study including two males and three females. The mean age of students at the time of the study was 6.24 years. Four of the students were Caucasian, and one student was Asian. Three of the five students had an IEP for Speech and Language Services at the time of the study that specified they participated in normal classroom activities. Students participated in five 30 minute lessons per week for six weeks. The study occurred during an eight week period. The first week of the
The goal of the researcher was to determine if explicitly teaching students how to blend and segment phonemes would improve the decoding abilities of five first grade students. Research documents the importance of students obtaining phonological awareness skills in early years to decode words more accurately and become a proficient reader (Torgesen, 2000). Without explicit instruction in word recognition skills, students may continue to experience reading challenges throughout school. During the eight week study, the researcher explored the effectiveness of explicit instruction in blending and segmenting phonemes on overall word recognition abilities. The researcher instructed a small group of students through the use of modeling, guided practice, and independent practice. All pretest and posttest data was collected, analyzed, and scored by the researcher. With the Common Core State Standards for English Language Arts explicitly stating that students in Kindergarten through fifth grade must know and apply grade level phonics and word analysis skills in decoding words, the researcher formulated several questions regarding word recognition abilities with an emphasis on blending and segmenting phonemes that led to the development of this study. The next chapter explores the
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research surrounding word recognition, phonological awareness, and blending and segmenting phonemes.
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CHAPTER TWO: LITERATURE REVIEW

Reading research provides strong evidence that children who begin as poor readers will typically remain as deficient readers throughout their schooling and beyond (Adams, 1990; Juel 1988; Stanovich, 1986; Torgesen & Burgess, 1998). The effect of early reading failure supports the need for early intervention for struggling readers. An intervention that is designed to meet areas of deficiency can help students become proficient readers. One way to assist struggling readers is to provide explicit, systematic instruction in phonological awareness and word decoding (Torgesen, 2000). Students can then be taught letter-sound correspondences and learn that spoken words are represented by written words (de Graaff, Bosman, Haselman, & Verhoeven, 2009). This research is supported by the studies addressed in this chapter and enabled the researcher to assist struggling readers.

This chapter summarizes studies that addressed the important questions regarding this action research project: What effect does word recognition have on reading performance? What effect does phonological awareness have on decoding? What effect does blending and segmenting have on a student’s ability to decode? Cummings, Dewey, Latimer, and Good (2011), Noltemeyer, Joseph, and Kunesh (2013), Cohen and Brady (2011), Ayala and O’Connor (2013), and Giess, Rivers, Kennedy, and Lombardino (2012) focused on word reading strategies to improve overall word reading performance. Lane, Fletcher, Carter, Dejud, and DeLorenzo (2007) and Ryder, Tunmer, and Greaney (2008) focused on phonological awareness and phonemic awareness interventions to improve word reading of struggling readers. Pullen, Lane, Lloyd, Nowak, and Ryals (2005), Yeh and Connell (2008), Allor, Gansle, and Denny (2006), Daly, Chafouleas, Persampieri, Bonfiglio, and LaFleur (2004), and Daly, Johnson, and LeClair (2009) focused on the skills of blending and segmenting phonemes to improve students’ ability
to read words effectively. While the studies all differ, all researchers explored the effects of word recognition strategies to improve the reading performance of struggling readers.

**Word Recognition**

One component of fluent reading is forming connections between letters and sounds (Ehri, 2002). A reader will recognize a word by quickly activating grapheme-phoneme connections to retrieve pronunciation and meaning when reading (Ehri, 2005). In this section, a number of researchers studied word recognition to understand the influence of word recognition on fluent reading. The first study conducted by Cummings, Dewey, Latimer, and Good (2011) examined the correlation between initial skill and rate of progress on a measure of the alphabetic principle to reading outcomes as measured by Oral Reading Fluency. The second study by Noltemeyer, Joseph, and Kunesh (2013) attempted to determine whether a small group phonics instructional approach would improve kindergarteners’ word reading ability. The third study by Cohen and Brady (2011) examined the effects of a reading intervention that integrated vowel pattern analysis and children’s literature on word decoding performance. The fourth study by Ayala and O’Connor (2013) examined the effects of using video to self-model decoding skills of children that were at risk for reading disabilities in order to improve decoding skills and sight word recognition. The fifth study by Giess, Rivers, Kennedy, and Lombardino (2012) explored the effectiveness of a supplemental reading instruction program aimed at increasing the lower-level reading skills of a group of adolescents with reading problems. All of the studies explored factors that influenced word reading ability and examined instructional approaches to improve or predict word reading ability.
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Cummings, Dewey, Latimer, and Good (2011) attempted to determine if a relationship existed between initial skill and rate of progress on a measure of the alphabetic principle, Nonsense Word Fluency (NWF) and first grade reading outcomes as measured by Oral Reading Fluency (ORF). The NWF and ORF were measures from the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Dynamic Measurement Group, 2008) assessment. The researchers made three hypotheses. First, that the relationship between NWF growth and ORF outcomes will be mediated by initial status as other researchers have determined (Good et al., 2009; Harn et al., 2008). Second, they wanted to ascertain that the pseudoword reading strategy type of unitization would add to the prediction of ORF outcomes beyond NWF initial status and growth over the year. Third, they wished to determine if students who unitized would demonstrate the highest ORF scores at the end of first grade. Students who unitize read the whole pseudoword as a unit (/sig/), and do not sound out by phoneme or by blending. The independent variable was the predictor of a relationship between NWF and ORF. The dependent variables were measures of the alphabetic principle using a NWF task, coding of a modified NWF task, and a standardized test of reading accuracy and fluency to measure ORF.

On the NWF task, students read a series of randomly ordered vowel consonant (VC) and consonant vowel consonant (CVC) nonsense words. Students would either state individual letter sounds or read the nonsense word. The measure was administered for one minute, and the final score was the correct number of letter sounds produced. The NWF was administered a second time using modified directions (Good et al., 2011). The directions were intended to be easier to understand and shorter. Student responses were scored in the same manner, but after administration each nonsense word attempt was categorized into one of five categories of pseudoword reading strategy. The five categories were unit (/sig/), sound (/s/ /i/ /g/), recode (/s/
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\(/l\ /g/ /\text{sig}/ \text{or} /ls/ /\text{ig}/ /\text{sig}/\), partial blend (/ls/ /\text{ig}/\), and error. Student scores were recorded as a proportion for each strategy type and sum to 1. For example, if a student read 10 pseudowords on the NWF probe and used a unit strategy for four, sound for two, recode for three, and had one error, their scores for units, sounds only, recodes, partial blends, and errors would respectively be .40, .20, .30, .00, and .10 to equal a sum of 1. On the ORF task, an individually standardized subtest of DIBELS was administered to assess reading accuracy and fluency. The student read a passage aloud for one minute and the words read correctly and errors were recorded.

Participants were first grade students from 12 school districts, eight in the west and four from the Midwest in eight states. The 12 school districts were recruited as part of a larger project to evaluate a newer version of DIBELS (Dewey, Latimer, Kaminski, & Good, 2011). The final sample included 3150 first grade students with data for an entire year. This group was referred to as the large sample. A single school was recruited from the larger sample to examine the relationship between NWF and ORF more closely. The school was selected due to its geographic proximity to the research organization in the Pacific Northwest. The final sample included 66 first grade students with data for an entire year. This group was referred to as the small sample. The students within the small sample were predominantly Caucasian, 72% Caucasian, 17% American Indian/Alaskan, and 8% Latino/a. The school had a free/reduced-price lunch rate of 58%. Additional demographic information for the small sample was not included in the study.

All data collectors who participated in the study were required to attend a one day Webcast training presented by Cummings. Examiners had the opportunity to practice with colleagues and receive feedback administering the measures. The school-based data collectors were responsible for collecting all of the large sample’s data. They administered the DIBELS assessments in the fall, winter, and spring to all students in their schools. Data for the small
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group were collected in the winter, within two weeks of the winter assessment. Training for this data collection, the coding of NWF responses occurred during two weeks with two, one hour sessions. Following the data collection, all NWF booklets from the small sample were rescored by two of the trained data collectors. The agreement between the rescored booklets and the first author’s review was 100%. Data from the large group was analyzed to assess the role of initial NWF status (fall) and NWF growth in first grade on the prediction of later reading outcomes (ORF) using hierarchical regression. Data was also analyzed to measure the effect of a change in the NWF directions on the relation between NWF and ORF by examining the correlations and descriptive statistics. Data from the small group was analyzed to assess the role of NWF strategy on the prediction of later ORF scores using a hierarchical cluster analysis and a weighted regression.

Results of the large sample group demonstrated strong positive correlations between NWF and ORF ($r =$ 0.69 to 0.82 for fall/winter/spring NWF scores with winter/spring ORF). The effect sizes for NWF gain from fall to winter ($r =$ 0.23, $p < 0.001$) and from fall to spring ($r =$ 0.25, $p < 0.001$). The average gain for NWF across the year was 41.3 correct letter sounds (fall to winter gain = 22.0; winter to spring gain = 19.3). A regression model was fit to the data from the large sample group, and allowed the effect of fall NWF on spring ORF to vary across nine NWF scoring strata. The results suggested that the effect of fall to spring NWF gain was similar for students who scored between 0 and 48. The effect was significantly reduced for students who score above 49. Students with a score below 48 were considered to have a lower initial skill, and thus made more progress with a similar pattern of change on the spring ORF scores. For every one unit gain from fall to spring on NWF, spring ORF scores increased approximately half a
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word. Students with a score above 49 had a higher initial skill and their progress was moderated on the spring ORF scores.

Results of the small sample group demonstrated that a correlation (0.84) between NWF words attempted and NWF score could be used as an estimate of NWF accuracy. The average fall to winter NWF gain was 15.47 correct letter sounds. To determine if a change in the NWF directions affected the relationship of NWF to ORF, paired $t$-tests and $F$ tests were performed. There was no evidence to suggest that the change in directions affected the outcome. The mean scores were not different from each other, 45.42 (19.83), 43.42 (18.85) ($p = 0.20$ from a paired $t$-test), variance ($p = 0.66$) from $F$ test. The strategy associated with the strongest ORF performance was unitization (0.33 and 0.39, $p < 0.001$, for winter and spring ORF). A series of weighted regression models were conducted to determine the added value of NWF strategy variables when predicting ORF. Both the fall NWF score and fall to winter NWF gain were powerful predictors of winter ORF ($p < 0.001$ and $p = 0.02$, respectively). A hierarchical cluster analysis was used to group students together based on their predominant NWF strategy. The two strategies with the fewest errors were unit and recode. The largest cluster represents the students ($n = 21$) who mainly used the unit strategy (0.69), but also made errors (0.20). There was strong evidence that students who used either the unit or the unit-error strategy achieved a higher spring ORF score ($p$ value = 0.01 and 0.02) than those students in the error cluster. On average, students who predominantly unitized, even while making errors, scored approximately 11 points higher on spring ORF than students who primarily made errors.

The results of the study indicated that both NWF initial status and progress across the first grade year predicted ORF outcomes. A change in the directions for the NWF did not affect the predictive power of that relationship. By analyzing students’ responses to NWF, students’
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decoding strategies could be obtained. Students who read nonsense words fluently by unitizing the word demonstrated better performance on later reading skills. The alphabetic phase that dominated students reading strategies at that time would be attained by examining the booklets. The unit group had the highest ORF scores at the end of first grade and closely corresponded to the consolidated alphabetic stage. The errors group performed most poorly on ORF and corresponds to students with skills between the pre-alphabetic and partial alphabetic stages. They would also be predicted to have the lowest scores on reading.

Similar to Cummings, Dewey, Latimer, and Good (2011), Noltemeyer, Joseph, and Kunesh (2013) also conducted a study related to word recognition. The researchers attempted to determine whether a small group phonics instructional approach would improve kindergarteners’ word reading ability. The study addressed two research questions. The first was intended to determine whether or not the phonics flashcard drill and practice intervention was effective at improving the number of words read correctly immediately following each instructional session. The second was designed to determine whether the words read correctly after each drill and practice session were retained at a one week follow up assessment. The independent variable was the instructional approach. A phonics flashcard drill and practice small group intervention was implemented for six students. The dependent variable was an informal assessment of phonics words. The words were selected from a list in a McCormick (1999) reading textbook. Each participant was individually assessed on the number of words retained following each instructional session, on the number of words retained at one week, and the number of control words read correctly. Six words were administered during instruction, and six control words were assessed each week. The words used were orthographically regular according to phonics rules.
Six kindergarten students participated in this study. The students were selected from 11 students identified by their teacher as a potential participant due to their low emergent reading skills. Participants were identified due to the administrators receiving signed consent forms from the participants, and one student switched to a different educational setting before the experiment began. The average age of the participants was 6.0 years old. Two of the participants were African American boys and four were African American girls. None of the participants were formally identified as receiving special education services. The participants were randomly assigned to one of two experimental groups. The participants attended a primary school in a metropolitan district bordering a large city in the Midwest of the United States of America. Within this school, approximately 60% of the student population was classified as Economically Disadvantaged. Slightly over 60% of the students are African American, while the remaining students were identified as Hispanic, White, or Multi-Racial. Fifteen percent of the student population was classified as being Limited English Proficient, as well as 15% of the student population was identified as having a disability.

The study began by individually assessing each participant to establish a list of words unknown by all participants in each group. The words used in the pre-assessment were selected from a list in the McCormick (1999) textbook. The words in the pre-assessment were presented to the participants in a random order. Participants were presented a card, prompted to read the card aloud, and then were allowed three seconds to respond. An incorrect response or “no response” was recorded as “unknown” while correct responses were recorded as “known.” The participants were directed to read 20 words in addition to a group of six control words. The pre-assessment was administered at the beginning of each week before the instructional sessions. After unknown words were identified, small group phonics instruction began. The students were
instructed in groups of three. Each session was audiotaped and timed. The taping began when the first word was presented and ended after a time limit of ten minutes. After each session and after one week of instruction, the assessments were administered to determine the number of words retained. Instructional small group phonics lessons occurred twice a week for five weeks. At the beginning of each week, the participants were instructed to read the six control words and 20 words to determine the unknown words that would be used in instruction that week. Phonics instruction consisted of the teacher presenting a card to the group, pronouncing the individual phonemes of the words, and then blending them together to read as a whole word. After the teacher said the phoneme of each word, the students chorally repeated the phoneme. After the teacher blended the phonemes together, the students were directed to read the word. All six words in each lesson were presented in this manner. The cards were then shuffled and the children were asked to independently read the words again using the same procedure. Words were shuffled after each round, and presented repeatedly until ten minutes had expired. Data was analyzed comparing the means from the pre-assessment and the words read after each session and after one week. The audiotapes were also analyzed as a qualitative observation.

The results of the study demonstrated that the phonics treatment resulted in gains in the number of words recalled compared to the number of pre-assessment and control words read correctly for all six participants. The mean number of treatment words recalled per session during the phonics instruction was 4.20 (SD=1.555) out of a maximum score of six. When examining the control words per session recalled across the six participants, the mean was quite close to zero (M=0.20 words, SD=0.645). Weaker results emerged for the intervention on word reading at one week post-test. The mean number of words recalled at one week across all intervention sessions was 1.24 (SD=1.30) compared to the mean of 4.20 from the immediate
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post-test. Qualitative observations revealed that two students were able to learn most of the words after the first teaching experience and rarely made mistakes. Students who were most delayed in literacy skills needed repeated practice before learning a word.

The intervention was effective at improving words recalled immediately after the instructional period as compared to pre-test and control word performance. The results of the study demonstrated that students as young as kindergarten can learn to read words in brief, small group drill and practice sessions that allow for constant modeling by teacher, opportunities for students to respond, and teacher feedback. The results of this study also show that many gains were lost by the one week recall assessment. With the intervention being so brief, students were not allowed additional practice and reinforcement of skills. The researchers deliberately wanted to determine if gains could be obtained from such a brief intervention, which they found was not successful at maintaining word knowledge.

Similar to the first two studies, Cohen and Brady (2011) also conducted a study related to word recognition. However, Cohen and Brady attempted to determine the effects of a reading intervention that integrated vowel pattern analysis and children’s literature on the word decoding performance of second grade students with reading disabilities. The intervention evaluated students’ performance in decoding a set of training words using three common vowel patterns (Magic e, Double Vowels, and Closed) in isolation and in context. Novel words (untrained words) and nonsense words were presented using the same vowel patterns to evaluate generalization of the reading intervention. The study addressed two research questions. The first was designed to determine if students who received a reading intervention integrating meaning-based and code-based strategies would increase their reading accuracy on training words that contain three common vowel patterns in isolation and in context. The second was designed to
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determine if students who received the intervention would increase their reading accuracy of
novel words and nonsense words that contain the same vowel patterns as the training words. The
independent variable was the reading intervention that integrated code-based strategies (vowel
pattern analysis) along with reading for meaning elements (children’s literature) to assist with
decoding performance. One dependent variable was a pre and posttest measure using three
subtests from the Woodcock Reading Mastery Tests-Revised (WRMT-R/NU; Woodcock, 1987).
The three subtests were word identification, word attack, and passage comprehension. Form G
was used for the pretest and Form H was used as the posttest. Another dependent variable was a
daily evaluation of accuracy in reading training words in context and in isolation. To measure
words in isolation, each day 15 words (five words for each vowel pattern) were selected at
random from the master list of 150 words, and students were instructed to read the word cards.
To measure words in context, each day the students read five sentences (15 sentences in total)
that included training words from each vowel pattern. A third dependent variable was a daily
evaluation of accuracy in reading novel words and nonsense words to assess generalization of the
vowel patterns. To measure the accuracy of reading novel words, students read five words (15
generalization novel words total) from the master list of the three vowel patterns each day.
Reading accuracy of nonsense words was also evaluated. Each day, students read five nonsense
words from each of the patterns that were randomly selected from a master list of 15 words.

Five students with reading disabilities were chosen as the participants. Of the five, three
were boys and two were girls. All five were diagnosed with reading disabilities by school
psychologists and were selected from a single class in a private elementary school for students
with learning disabilities. All students were from upper middle-class families, and spoke English
as their primary language. Two of the students had a least one Hispanic parent, and all were
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Caucasian. All participants were categorized as reading below grade level according to the WRMT-R/NU. Two of the students participated in the special education program in the previous school year, and the other three had not been enrolled previously in special education. Six criteria were used to select participants for this study, including: second grade placement, willingness of parent and child to participate, regular attendance, full-scale IQ > 90, students’ phonics abilities, and a substantial discrepancy between students’ IQ scores and their word identification scores on the WRMT-R/NU. All students demonstrated at least a full standard deviation discrepancy between their IQ scores and their word identification scores. To meet the phonics criteria students needed to have the ability to (a) produce consonant sounds when presented letter symbols with at least 80% accuracy, (b) match consonant sounds to letter symbols, with at least 80% accuracy, and (c) score less than 50% accuracy reading words that contained two or more of the three vowel patterns.

The reading intervention consisted of daily whole group instruction for the entire class, including the five participants, approximately 40 minutes in duration. The instruction contained two components that were approximately 20 minutes in duration. Shared reading of children’s literature (meaning-based activities with Big Books) was the first component, and explicit phonics instruction using vowel patterns (code-based instruction) was the second. The entire intervention was 31 days. The “Magic e” vowel pattern was 15 days, “Double Vowels” 11 days, and “Closed Vowels” 5 days. Throughout the intervention, six observations occurred to assure the fidelity of the instruction. Each lesson began with a shared reading of a specific story from one of 10 books from the Big Books series (Wright Group, 1998; 1996). Books were selected because they contained at least five examples of different words of the vowel pattern targeted for instruction. The teacher followed a three step sequence each time a new Big Book was
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introduced. First, the teacher read the book aloud. Next, students were directed to chorally read the book along with the teacher. Finally, students volunteered to read short segments of the book aloud individually. Additional instructional activities accompanied each Big Book. Activities included semantic maps, guided questioning, illustrating parts of the story, and writing about their illustration. After shared reading activities, explicit instruction in one of the three vowel patterns was provided each day. Instruction on “Magic e” was the first pattern followed by “Double Vowel” and then “Closed Vowel.” Words were chosen from the Big Book used in the lesson. The words were written on the whiteboard using a black marker for consonants and a red marker for the vowel sounds. The teacher discussed the rule for the vowel pattern, applied the rule to the words on the whiteboard, and emphasized the position of the vowel pattern within the word. Then the teacher provided each student word cards that incorporated the targeted vowel pattern. The words included were derived from the Big Book used that day, as well as other words from the same word family or rime. The words became the training words used in this study. Students were instructed to read the word on the card, and then copy it into the correct location on a Vowel Pattern Chart (Cheyney & Cohen, 1999). Next, students traced the vowels in the word on the chart using a red marker, and demonstrate the American Sign Language hand sign for the letter representing the vowel. On alternate days, students constructed words related to the Big Books using poker chips, with black letters for consonants and red letters for vowels. When the poker chip activity was used, a guided spelling activity followed. The guided spelling activity required the teacher to draw blank lines on the whiteboard, black lines for consonants and red lines for vowels. Students would spell the selected word by placing a letter onto each blank line. Two students required additional support when their progress appeared to have stalled after several days of the group intervention. The two students met with the teacher for an
additional 5 to 10 minutes a day to receive a portion of the group lesson that was taught earlier. They received additional practice and individual feedback on the vowel pattern presented earlier in the story. One student received nine extra sessions, and the other student received 15.

Data was collected daily to measure students’ accuracy when reading training words in isolation, training words in context, novel words, and nonsense words. Each prompt was scored as “correct” or “incorrect.” Each vowel pattern was analyzed separately. The three subtests of the WRMT-R/NU were also administered individually to each participant for pre and posttest data. The pre and posttest scores were analyzed by raw score, standard score, and age equivalents for each participant.

The results of this study demonstrated positive growth on the three vowel patterns targeted during the intervention for the accuracy of reading training words in isolation and in context, and the generalization of novel words and nonsense words. After intervention, the mean score for the “Magic e” pattern in isolation was 96% compared to the baseline of 13%. The mean score for the “Magic e” pattern in context was 98% compared to the baseline of 38%. The mean score for the “Double Vowels” pattern in isolation was 95% compared to the baseline of 33%. The mean score for the “Double Vowels” pattern in context was 99% compared to the baseline of 54%. The mean score for the “Closed Vowel” pattern in isolation was 98% compared to the baseline of 81%. The mean score for the “Closed Vowel” pattern in context was 98% compared to the baseline of 88%. The overall mean score for the “Magic e” pattern of novel words increased to 87% compared to the baseline of 4%. The mean score for the “Magic e” pattern of nonsense words increased to 83% compared to the baseline of 2%. The mean score for the “Double Vowels” pattern of novel words was 89% compared to the baseline of 22%. The mean score for the “Double Vowels” pattern of nonsense words was 88% compared to the baseline of
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17%. The mean score for the “Closed Vowel” pattern of novel words was 93% compared to the baseline of 55%. The mean score for the “Closed Vowel” pattern of nonsense words was 91% compared to the baseline of 47%. Growth was also measured on the WRMT-R/NU. For the word identification subtest of the WRMT-R/NU, the mean score gain for the five students was 12.8 words correct (raw score), 6.4 points (standard score), and 5.6 months (actual age-equivalent). On the word attack subtest of the WRMT-R/NU, the overall mean score gain was 7.4 words correct (raw score), 7.8 points (standard score), and 8.2 months (actual age-equivalent). For the passage comprehension subtest of the WRMT-R/NU, the overall mean score gain was 6 responses correct (raw score), 3.4 points (standard score), and 4.8 months (actual age-equivalent).

The intervention results demonstrated that students with reading disabilities benefited from a reading intervention that integrated teaching strategies based on vowel pattern analysis and children’s literature. All participants substantially increased their word reading accuracy after the intervention and their accuracy become more stable. Words were more easily read in context than in isolation using the training words. This could be due to the use of context clues instead of depending on the graphophonic cueing system alone. Novel words were more easily recognized than nonsense words. This could be due to the meaning attached to the words and that children have encountered them before as an oral language experience. In addition, the increases in decoding ability were maintained well after the intervention ended.

Comparable to the first three studies, Ayala and O’Connor (2013) completed a study that focused on word recognition and decoding skills of children at risk for reading disabilities. Ayala and O’Connor examined the effects of a Tier 3 intervention in Video Self-Modeling (VSM) in order to improve student’s reading performance. Ten first grade students who responded poorly
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to 15 weeks of Tier 2 RTI instruction received an intervention of VSM to examine whether this instructional tool would affect their decoding skills and sight word recognition. The researchers intended to answer two research questions. The first was whether VSM would improve the decoding skills of children at risk for reading disabilities. The second was whether VSM would improve the sight word recognition of children at risk for reading disabilities. The independent variable was the personalized VSM intervention the ten participants received. VSM involved the video recording of a student performing a target behavior while either prompted or coached within a scripted or naturalistic setting. The target behavior was one that was desired and/or slightly beyond the student’s current ability. The video recording was then edited to remove the prompting and coaching, which left the student with a video of his or her own successful performance of the target behavior. The dependent variable, the Basic Phonics Skills Test (BBST; Shefelbine, 2006), administered in September and re-administered in January and April for pre and posttest data. The 100 items on the BBST comprised letter sounds, vowels, digraphs, and word reading. The test was aligned with the California English Language Arts Content Standards for kindergarten and first grade. Three additional measures were also used to collect baseline and progress data. The Nonsense Word Fluency (NWF) probe from the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good et al., 2004) measured the amount of nonsense words that were read correctly. The second and third measures were curriculum based measures (CBM) that consisted of decodable and sight word card sets from the Systematic Instruction in Phoneme Awareness, Phonics, and Sight Words (SIPPS; Shefelbine, 2006) reading instruction program.

The participants included ten first grade students who attended a Title 1, low socioeconomic status elementary school in southern California. The schools’ ethnicity included
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68% Hispanic, 16% Caucasian, 9% African American, and 7% other. Thirty percent of the students were English language learners and predominantly spoke Spanish. Eighty percent received free or reduced lunch. Of the participants, 30% were female and 50% male. All but one of the participants spoke English as their first language. The ethnicity of the participants included six Hispanic students, three Caucasian students, and one African American student. The participants’ ages ranged from 6 years 4 months to 7 years 9 months. The participants who received the VSM intervention had attended the school since kindergarten and demonstrated deficits in decoding skills and phonemic awareness throughout kindergarten and half of first grade. Their scores on the BPST administered at the beginning of the school year revealed a non-passing score for each participant.

The collection of baseline data required two weeks at the beginning of the study. The VSM intervention began the first week of February and continued for eight weeks thru March. The Tier 3 intervention using VSM occurred four times a week in the reading specialist’s (Ayala) room. For each personalized video, each student was video recorded participating in a reading intervention session that included oral blending of letter sounds, segmenting, and sight word recognition slightly beyond their present ability. The skills matched their daily Tier 2 sessions. Each video recording was conducted in a private classroom to eliminate noise or distractions. For each VSM video, students were instructed to blend a consonant vowel consonant word, and were directed to identify the sounds. The tutor modeled the sounds and how to blend them when the student was unsure. When the video was edited, the tutor coaching and modeling was removed and only the student remained with perfect blending of the sounds. The same process occurred for segmenting sounds and for reading sight words. Each video included five decodable words and five sight words. The recording process required less than five minutes.
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per video. The student video was typically two minutes long with the student correctly decoding words and recognizing sight words. During this study, three to four videos were created for each student. Students viewed their videos four times per week at a computer before participating in their Tier 2 reading group instruction. The reading specialist used Systematic Instruction in Phoneme Awareness, Phonics, and Sight Words (SIPPS; Shefelbine, 2006) as the Tier 2 reading instruction program. SIPPS is a systematic phonics program that was developed by John Shefelbine. The SIPPS first grade instruction consisted of oral blending, segmenting of syllables and consonant vowel consonant words, and sight word recognition. Students’ Tier 2 reading groups included four to six students for 25 minutes, four days a week. Students were also provided a copy of their videos to view during free time upon their request. Students also took home copies to share with their families. Twice a week, after students had viewed their videos and participated in their Tier 2 SIPPS reading instruction, students were progress monitored using the NWF probe, read from a set of decodable words, and from a set of sight words to assess the number of words correctly recognized. Ayala, a special education teacher, and a teaching assistant administered the VSM intervention and were also responsible for data collection and intervention fidelity. Data was analyzed through a visual analysis (Horner, et al., 2005; Riley-Tillman & Burns, 2009) which involved examining data to compare baseline with the intervention phase, aimed at seeking out patterns or changes to determine the effectiveness of an intervention. The researchers then established the percentage of non-overlapping data (PND) for each student by taking the number of data points above each student’s highest individual baseline score during the intervention phase and divided that by the total number of data points.

Intervention effectiveness was measured with the PND for each measure, which ranged from 70-90 percent across students. Seventy to 80 percent is considered effective, and 90 percent
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is considered very effective. When pre and posttest scores were examined on the Basic Phonics
Skills Test, all students demonstrated improved letter sound, digraph, and vowel recognition and
earned passing scores above 80, the average score for mid-year first graders. Students
demonstrated a 14-67 point increase on the Nonsense Word Fluency probe. Results of the SIPPS
Tier 2 placement test showed that all students advanced one or more instructional levels, with
mastery of 10 lessons.

Overall, positive effects for VSM were visible in improving decoding skills and sight
word recognition for students at risk for, or already identified with reading disabilities. In this
study, students who responded poorly to Tier 2 decoding instruction improved their decoding
and sight word reading ability following the implementation of VSM. First grade students who
responded poorly to Tier 2 instruction were likely to have difficulty with decoding, with
recognizing sight words, or difficulty with both as they were still beginning to read. This study
revealed that technology could offer additional support for the students at other times of the day
including at home, during or after school, and on weekends. Students were able to view
themselves as successful readers and were able to practice skills that have been recorded and
made portable through multiple devices. Some of the positive effects could be contributed to the
student’s motivation of using technology.

Similar to the above studies, Giess, Rivers, Kennedy, and Lombardino (2012) completed
a study that focused on word recognition, however, the researchers also incorporated spelling
skills aimed toward adolescents. Giess, Rivers, Kennedy, and Lombardino explored the
effectiveness of a reading and spelling system that was used as a supplemental reading
instruction program. The Barton Reading and Spelling System© (BRSS; Barton, 2000) was used
in this study and was an Orton-Gillingham based reading instruction program. The purpose of
the study was to determine the effectiveness the program had on increasing the lower-level reading skills of a group of adolescents with persistent reading problems. The dependent variables included subtests from the Woodcock-Johnson III Tests of Achievement (WJ III; Woodcock, McGrew, & Mather, 2001) and the Test of Word Reading Efficiency (TOWRE; Torgesen, Wagner, & Rashotte, 1999). The subtests used on the WJ III included letter-word identification, spelling, word attack, and sound awareness. The subtests used on the TOWRE included sight word efficiency and phonemic decoding efficiency. The independent variable was the supplemental intervention using the BRSS which was designed to provide simultaneous multisensory instruction by appealing to students’ visual, auditory, tactile, and kinesthetic senses. The BRSS was divided into ten levels of increasingly challenging decoding and spelling rules of English. The levels were then delivered in a ten step systematic and cumulative sequence. The BRSS was used in addition to the specialized services that the participants were already receiving in the school.

The participants included nine students who attended a charter school for adolescents with reading based academic difficulties. Participants were selected from a pool of 30 students who were in the ninth to eleventh grades. The school was located in a small rural town in central Florida but drew students from the more populated surrounding areas. Of the 30 students, nine met the study inclusion criteria. All participants were native English speakers, and ranged from 15.2 years to 17.5 years in age. Of the nine students, four were male and five were female. Seven participants were in grade 10 and two were in grade 11. Five of the participants had a primary classification of specific learning disability (SLD), two had a primary classification of SLD with an additional exceptionality of speech-language impaired (SLI), one had a classification of other health impaired (OHI), and one had no classification.
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The BRSS intervention included ten levels that were comprehensive in scope, beginning with basic phonemic awareness skills and culminating with Latin roots and Greek forms. The ten levels were sequenced according to the following hierarchy: phonemic awareness, consonants and short vowels, closed and unit syllables, multi-syllable words and vowel teams, prefixes and suffixes, six reasons for silent E, vowel-R’s, advanced vowel teams, influence of foreign languages, and Latin roots and Greek combining forms. The lessons began with a quick review of the previous lesson and a phonemic awareness drill. The instructor then introduced a new rule to the student using tiles of different colors, letters, and letter combinations. The student practiced the new rule by reading and spelling real and nonsense words with the tiles, and then by reading and writing real and nonsense words on paper. Once the student has mastered the new rule at the word level, s/he progressed to reading and spelling phrases and sentences on paper. While the student was writing, reading fluency, accuracy, and phrasing were emphasized. The student then practiced reading fluency, accuracy, and phrasing with phonically-controlled text. Throughout the procedures, students used segmenting and blending by segmenting whole words into smaller parts, and blending individual sounds/letters into whole words. Specific multisensory strategies were used in the BRSS lessons. The strategies included tapping out vowel sounds with key words while saying the sound and key word, touching each letter tile and saying the corresponding sound, finger spelling words while saying corresponding sounds, and visualizing the grapheme form of sight words. As students progressed through the ten levels, some of the steps were discontinued from the lessons. Reading tutors were used to implement the BRSS intervention. Tutors were recruited from first year graduate students in the Communication Sciences and Disorders Program from a large southern university. Tutors were trained through a series of instructional video tapes. The tapes described the nature of reading
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disability and provided an example of what was taught in the program and how it needed to be implemented. The training tapes explained a spelling or reading rule, and then demonstrated the procedures used to teach the rule by role playing with a demonstration student. After the demonstration, tutors paired up to practice the procedures and took turns being the tutor and student. The training sessions were conducted for nine weeks a total of 27 hours. To determine the level at which the tutor began with her student, students had to complete pretests within BRSS with a strict pass/fail criteria. Based on the pretest protocol, five students began at Level 1, Lesson 1, one began at Level 1, Lesson 3, two began at Level 2, Lesson 1, and one began at Level 2, Lesson 2. Data was collected on a tracking sheet that each tutor used at every session. The sheet allowed the tutor to record the student number, date, time of session, number of session, and the beginning and ending procedure for each lesson. A pretest-posttest design was used in this study to collect data as well. To analyze pretest and posttest data, gain scores and effect sizes were calculated. Effect sizes (Cohen’s $d$) were calculated to measure the size of the impact that the intervention had on student progress. Cohen’s (1988) descriptive guidelines for the interpretation of effect sizes included $0.2 = \text{small}$, $0.5 = \text{medium}$, $0.8 = \text{large}$.

The mean scores for the posttest were consistently higher than the pretest mean scores. Not every student experienced gains in each subtest, but the trend suggests that the students made gains across measures. Overall, the effect sizes demonstrated that students made small to large gains in targeted skill areas. In regards to the WJ III ACH, there was a small effect size ($d=.19$) on the letter-word identification subtest, a medium effect size ($d=.53$) on the spelling subtest, a large effect size ($d=1.06$) on the word attack subtest, and a medium effect size ($d=.54$) on the sound awareness subtest. On the TOWRE, the effect size was small for both the sight word efficiency ($d=.34$), and the phonemic decoding efficiency ($d=.22$).
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This type of explicit intervention was aimed at increasing lower-level reading skills and was proven to be effective in improving the word recognition and spelling abilities of older students with persistent reading problems. Older students must have a solid foundation of phonological awareness skills as they move into more complex reading and spelling materials. Specific components of the BRSS may have accounted for the increase in posttest scores as compared to the pretest scores. The BRSS consistently used phonetically regular words and nonsense words that follow English rules to teach each spelling rule which impacted the letter-word identification and word attack subtests of the WJ III ACH. The achievement on the spelling subtest of the WJ III ACH could be attributed to the emphasis on phonics and practice in spelling that students received in the BRSS lessons. A final component of the BRSS that may have impacted students’ posttest scores was the consistent practice in reading and spelling sight words. Older students typically have fewer opportunities to work on their ability to read sight words efficiently on their own, therefore this gain was important.

The five studies in this section provided insight about the role of word recognition and its impact on overall reading. Students especially benefitted from an intervention that targeted word recognition skills. The first study by Cummings, Dewey, Latimer, and Good (2011) confirmed that Nonsense Word Fluency progress predicts Oral Reading Fluency for the end of the first grade year. The second study by Noltemeyer, Joseph, and Kunesh (2013) confirmed that small group phonics intervention was effective at improving words recalled immediately after an instructional period, especially when teacher modeling, opportunities for students to respond, and teacher feedback is provided. The third study by Cohen and Brady (2011) confirmed that an intervention that integrated teaching strategies based on vowel pattern analysis and children’s literature will increase word reading accuracy. The fourth study by Ayala and O’Connor (2013)
verified positive effects of video self-modeling on improving decoding skills and sight word recognition for children at risk for, or with reading disabilities. The fifth study by Giess, Rivers, Kennedy, and Lombardino (2012) established that the phonics based training intervention significantly increased the phonological awareness, word recognition, and spelling abilities of older students. The researchers of the five studies confirmed that word recognition skills were essential in accurate word recognition. Students lacking word recognition skills would benefit from an intervention that targeted those needed skills. In the following section, the role of phonological awareness on word recognition is discussed.

**Phonological Awareness**

Young children need to possess phonological awareness skills to become successful readers. Phonological awareness is a critical precursor, correlate, and predictor of reading achievement (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003). Phonological processing skills help to lay the foundation for learning phonics, the relationship between letters and the sounds that represent those letters (Vukelich, Christie, & Enz (2012). If children are to succeed in word recognition, phonological awareness instruction is a crucial component of a literacy program. In this section, a number of researchers studied phonological awareness interventions for struggling readers. The first study by Lane, Fletcher, Carter, Dejud, and DeLorenzo (2007) examined the effects of a paraprofessional led supplemental phonological awareness intervention with students who have poor early literacy skills and behavioral concerns. The second study by Ryder, Tunmer, and Greaney (2008) explored whether explicit instruction in phonemic awareness and phonemically based decoding skills would be an effect intervention strategy for students with early reading difficulties in a whole language instructional
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environment. Both studies examined the effects of phonological awareness interventions for primary aged students

Lane, Fletcher, Carter, Dejud, and DeLorenzo (2007) examined the effectiveness of a paraprofessional-led supplemental early intervention for first grade students with poor early literacy skills and behavioral concerns. The research question the researchers attempted to answer was whether or not a paraprofessional-led intervention would increase both the academic skills and behavioral performance of students with limited early literacy skills and antisocial behavior. The independent variable was the paraprofessional-led intervention program. The intervention program was in addition to the classroom literacy plan that included a balanced approach to literacy instruction. To implement the intervention program, the paraprofessional used a supplementary early reading curriculum, the *Phonological Awareness Training for Reading* (PATR; Torgesen & Bryant, 1994) which was designed to promote awareness of words’ sound structure by helping students learn how spoken language is represented by letters. The dependent variables included the Test of Phonological Awareness (TOPA; Torgesen & Bryant, 1994), Nonsense Word Fluency (NWF) a subtest of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Kaminski & Good, 1996), Total Disruptive Behavior (TDB), and Negative Social Interaction (NSI) both subtests of the Systematic Screening for Behavior Disorders (SSBD; Walker & Severson, 1992). The TOPA was a standardized test containing two subtests designed to assess a student’s awareness of individual sounds within words. In the first subtest, students were directed to identify which of three pictorially represented words had the same final sound as a stimulus word. In the second subtest, students were instructed to identify which of four words contained a different final sound from the other three words. NWF was a standardized subtest of DIBELS and was used to assess fluency of essential indicators of early
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literacy. Students were individually administered a probe that was one minute in duration. The TDB observation was used to monitor student behavior in the classroom. This classroom measure referred to a set of behaviors that inhibit instruction and disrupt the learning environment. Examples include touching another student’s property, hitting, biting, noncompliance with teacher directions, and being out of seat without permission. The NSI observation was used to monitor student behavior on the playground. This measure referred to a set of behaviors that disrupted ongoing play activities and involved physical or verbal aggression. Examples included rough contact with others or objects, name calling, bossy statements, accusations, and aggressive threats.

Participants were 24 first grade students with poor early literacy skills who were also at risk for emotional and behavioral disorders based on teacher nominations. Eighteen of the students were boys and six were girls. Twelve participants were European American, three were African American, and nine were Hispanic. Four of the students were receiving special education services, one for a learning disability and three for speech and language impairments. The students’ age ranged from 5.96 to 7.21 years. Students were randomly assigned to an intervention or control group, with the special education students split between the two groups with out differences in gender. Each group contained twelve students. No significant differences were revealed by t tests between the groups in regard to intellectual ability as measured by a Wechsler Intelligence Scale for Children, third edition (WISC-III; Wechsler, 1991) screening, attendance, or age.

Students in the intervention group were then randomly assigned to three groups with four students in each group. The students participated in PATR instruction, a supplemental reading curriculum, during the fall semester. The intervention was in addition to a literacy plan that
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included a balanced approach to instruction including exposure to core literature and explicit instruction in literacy skills. All intervention lessons were conducted outside of the core literacy block to ensure students participated in the full program. The intervention was administered by a paraprofessional who was trained prior to the intervention beginning. Training topics included an overview of reading development, components of an effective reading program, behavior management strategies, and practices with the PATR lessons and accompanying materials. Each intervention group met three days a week for 30 minute sessions during a ten week period. The PATR curriculum contained four activities: rhyming, blending, segmenting, and reading and spelling. Students first participated in rhyming activities, and then were taught how to blend sounds to form words. Then students learned how to segment words into individual sounds. Segmenting activities involved students identifying similar words based on initial sound, final sound, and medial sound. Students were also taught to identify sound positions in a given word. The final lessons incorporated letters to represent the sounds in a given word. The activities focused on applying students’ phonological awareness skills to reading and spelling tasks. Data was collected at three time points: pre-intervention, post-intervention, and retention at four weeks. Students’ academic and sociobehavioral performances were evaluated from multiple perspectives including standardized measures, curriculum based measures, and direct observations. Data was analyzed in two phases. A series of analysis of covariance (ANCOVAs) using pre-intervention scores and participant IQs as covariates were used to identify significant differences between intervention and control groups on all outcome measures at post-intervention. The second analysis involved analyzing the retention data separately for each group using repeated t-tests comparing data from post-intervention and retention to determine if changes remained four weeks after the intervention ended.
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Results from the ANCOVA using standard scores from the TOPA indicated a significant effect for group, $F(1,19) = 6.58, p=0.019$. Participants in the intervention group scored significantly higher at posttest ($M = 84.63$) than did the participants in the control group ($M = 76.40$). Results from the ANCOVA using scores from the NWF did not indicated a significant effect for group, $F(1,20) = 1.75, p=0.200$. A moderate improvement in decoding skills was suggested by the intervention group scoring higher at posttest ($M = 59.06$) than the control group ($M = 48.88$). In regards to social performance, the results from an ANOVA on NSI scores were not significant, $F(1,20) = 1.59)$. Means of participants in the intervention group ($M = 0.33$) were slightly higher than the control group ($M = 0.19$). The negative effect size of the intervention group suggested that there was a decrease in negative social interactions. Behavioral performance results from an ANCOVA on TDB scores were not significant, $F(1,20) = 0.86$. Means of the participants in the intervention group ($M = 3.53$) were slightly higher than the control group ($M = 2.04$). A series of $t$-tests were conducted between post-intervention and retention data to determine if students’ performance was maintained over time. Significant increases were not found on any measure except for NWF, $t(10) = 2.83, p = 0.018$. Although the academic progress results were modest, the results were sustained for four weeks following the conclusion of the intervention.

Students who participated in the intervention demonstrated significant improvements in phonological awareness skills as measured by a standardized test (TOPA), with gains being sustained after the intervention concluded. Students of the intervention group also experienced moderate growth on curriculum based measures of word attack skills (NWF). The TOPA standardized test paralleled the PATR curriculum program, which may have explained the results. The nonsense word fluency subtest could be considered a measure of transfer, which may
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have explained the differences in student performance. Decreases in negative social interactions on the playground were suggested by direct observations of social behavior. Through the direct observation of students’ total disruptive behavior in the classroom, students did not demonstrate significantly lower levels of disruptive behavior, but data suggest that the behavior was increasing slightly. Overall, students experienced improved early literacy skills but the results did not suggest positive effects on behavior.

Similar to Lane, Fletcher, Carter, Dejud, and DeLorenzo (2007), Ryder, Tunmer, and Greaney (2007) also researched the effects of a phonological awareness intervention. Ryder, Tunmer, and Greaney (2007) attempted to determine whether explicit instruction in phonemic awareness and phonemically based decoding skills would be an effective intervention strategy for children with early reading difficulties in a whole language instructional environment. The independent variable present in this study in regards to instruction was a teacher aide delivered phonemic awareness and phonemically based decoding intervention. The dependent variables present in this study included measures of phonemic awareness, phonological decoding ability, context free word recognition ability, accuracy of recognizing words in connected text, and reading comprehension. To measure phonemic awareness, four subtests of the Phonological Awareness Test (Robertson & Salter, 1997) were used to measure phoneme segmentation, phoneme blending, phoneme deletion, and phoneme substitution. To measure phonological decoding ability, an adapted version of a pseudoword decoding task developed by Richardson and DiBenedetto (1985) was used. To measure context free word recognition, a standardized test, the Burt Word Reading Test, New Zealand Revision (Gilmore, Croft, and Reid, 1981), was used. To measure word recognition accuracy in text and reading comprehension, accuracy and
comprehension subtests of the Neale Analysis of Reading Ability, Revised (Neale, 1988) was used.

Twenty four six and seven year old children participated in this study. The children were selected from a larger pool of 64 children who completed the Burt Word Reading Test, New Zealand Revision. The 24 children who participated in this study had the lowest Burt raw scores. The children were formed into matched pairs of 12, and the children in each pair were randomly assigned to an intervention or control group. The children in the intervention and control groups were divided approximately equally among four classrooms. Each group consisted of three Maori and nine European children. The school that participated in the study had a mixture of middle and low income families. Additional demographic data was not provided.

The intervention was conducted for a period of 24 weeks. The reading programs of the four classrooms that contained control or intervention groups strongly aligned with the whole language philosophy of teaching reading. In New Zealand, almost everything related to literacy education is controlled by the Ministry of Education, including curriculum, materials, and instructional guides to ensure a unified national education system. This allowed for a relatively uniform approach to literacy instruction in all four classrooms. The 12 children who received intervention were delivered a program that consisted of 56 highly sequenced, semi scripted lessons in phonemic awareness and phonemically based decoding strategies that were delivered by a teacher aide. The overall aim of the intervention was to provide struggling readers with direct instruction in making connections between the sounds of the corresponding letters and letter patterns. The children in the intervention group were further separated into four equal groups of three. Each group received four lessons a week that were approximately 25 minutes in duration. The intervention was in addition to their regular classroom literacy instruction. The
teacher aide who administered the intervention had some initial training in phonemic awareness and its importance in early literacy development. The teacher aide followed daily, semi scripted lesson plans that contained bold print for everything that she needed to say and do. The teacher aide was not allowed to deviate from the lesson plan unless she contacted her supervisor. The lessons and materials used in the intervention were based on theories, research, and activities from various sources. The lessons began with initial phonemes that could easily be segmented and stretched (m, s, r, f, a, n). Each of the lessons presented were in a set format and contained the following components: materials required, a 1-2 minute recap of previously learned material, 5 minutes of phonemic awareness exercises, a 10-15 minute main lesson focusing on teaching letter-sound correspondences, a 5 minute activity reinforcing the learning of the new material introduced in the main lesson, and reading of phonetically controlled storybooks (decodable texts). The materials used in the intervention included an alphabet chart, syllable picture cards, rhyme picture cards, phoneme counting picture cards, three picture cards for each of the first 25 phonemes, sound mats, letter tiles, picture cards representing CVC words, word lists, word slides, grapheme bingo cards, worksheets, phonetic storybooks, hand-held mirrors, individual white boards and pens, toy microphones, and stretch toys. The 12 children who participated in the control group received whole language instruction and supplementary activities for struggling readers by their classroom teacher. Following the intervention, the 24 children who participated in the study were administered the same tests that were administered before the intervention program.

After analyzing the posttest results, the intervention group significantly outperformed the control group on measures of phonemic awareness, pseudoword decoding, and context free word recognition ability. The Group X Time interaction effect for reading comprehension approached
statistical significance. The intervention group’s mean ($M=31.83$) for phoneme awareness was significantly higher than the control group’s mean ($M=15.42$). The intervention group’s mean ($M=18.50$) for pseudoword decoding was significantly higher than the control group’s mean ($M=4.75$). The intervention group’s mean ($M=33.58$) for context free word recognition was significantly higher than the control group’s mean ($M=26.17$). The intervention group’s mean for accuracy ($M=24.00$) and comprehension ($M=10.58$) approached significance when compared to the control group’s mean for accuracy ($M=18.17$) and comprehension ($M=7.67$).

The intervention program was successful in achieving the goal of significantly improving the phonological awareness skills, decoding ability, and context-free word recognition skills of struggling readers. The study determined that with children who possess low levels of essential reading skills will require a fairly structured and teacher supported introduction to reading. The children will then benefit from reading instruction that involves explicit and systematic instruction in orthographic patterns and word identification strategies. Children that do not receive this instruction will need to rely on ineffective word identification strategies.

The two studies discussed in this section demonstrated the effectiveness of a phonological awareness based intervention to improve word recognition. The first study by Lane, Fletcher, Carter, Dejud, and DeLorenzo (2007) confirmed that a phonological awareness intervention resulted in gains of word attack skills. The second study by Ryder, Tunmer, and Greaney (2007) confirmed that a phonemically based intervention was successful in improving the phonological awareness skills, decoding ability, and context-free word recognition skills of struggling readers. The researchers of the studies confirmed that a phonological awareness intervention results in gains of phonological awareness skills and increased word recognition
abilities. In the following section, the effects of incorporating blending skills in the decoding of words are discussed.

**Segmenting and Blending**

Segmenting and blending is an essential skill in reading, and is obtained through phonological awareness instruction. A child’s ability to segment and blend sounds together that create words is critical to becoming a proficient reader (National Reading Panel, 2000). Students entering first grade who lack phoneme segmentation and blending skills are likely to be poor readers in fourth grade (Juel, 1988). For students to decode words, they must segment and know the letter sounds, and then blend the sounds to determine the word. In this section, researchers have studied the phonological awareness skill of segmenting and blending and applied this skill to decoding words through explicit interventions. The study conducted by Pullen, Lane, Lloyd, Nowak, and Ryals (2005) investigated whether the effects of an intervention incorporating manipulative letters to promote segmenting, blending, sounding out, and spelling words would promote students’ skills in decoding pseudowords. The second study by Yeh and Connell (2008) attempted to determine if instruction that emphasized phoneme segmentation and blending would promote future reading ability more than rhyming or vocabulary activities. The third study by Allor, Gansle, and Denny (2006) examined the effects of implementing a game based phoneme segmentation and blending intervention on phoneme segmentation fluency with students who experienced difficulty with phoneme awareness. The fourth study by Daly, Chafouleas, Persampieri, Bonfiglio, and LaFleur (2004) examined the effects of students learning to blend and segment phonemes as students combined phonemes to read words. The fifth study by Daly, Johnson, and LeClair (2009) studied the effects of a two experiment study in which experimental analyses of phoneme blending and segmenting skills were conducted with
four first grade students. All of the studies explored factors that influenced reading abilities by incorporating phoneme segmentation and blending interventions with small groups of students.

Pullen, Lane, Lloyd, Nowak, and Ryals (2005) attempted to determine whether explicitly teaching essential components of beginning reading instruction would promote first graders’ skill in decoding pseudowords. The researchers examined the effects of an intervention that incorporated the use of manipulative letters to help with segmenting, blending, sounding out, and spelling skills. The purpose of this study was to analyze the timing of the effects of the intervention by monitoring student performance repeatedly over time. The independent variable was the explicit instruction using manipulative letters. Instructors were taught the procedures for the intervention and needed to follow scripted lessons. The dependent variable was the pseudoword-reading rate, or the number of pseudowords read correctly in one minute. Students read lists of pseudowords daily and the number of words read correctly and incorrectly was recorded. Through measuring the rate of pseudoword reading, the researchers were able to examine the participants’ degree of automaticity in decoding on a generalization task.

Participants included nine first grade students who were identified as struggling readers. A class-wide invented spelling screening (Lane & Pullen, 2004) was used to select participants. Students were provided ten words and instructed to spell them. The words were then scored based on phonological accuracy. This measure was administered with more than 2,000 kindergarten through second grade students. Students who scored below the 20th percentile were selected as possible participants and were further assessed on a pseudoword reading assessment. The students who scored lowest on the pseudoword assessment were chosen to participate. The nine participants were located in two first grade classrooms in a private parochial school in north
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central Florida. The school has many students on scholarships and included students from various socioeconomic groups. Additional demographic information was not provided.

The intervention was implemented by graduate students who attended the local university of the researchers. The intervention was implemented with three groups of students, and the lessons were in a quiet location away from distractions. Intervention lessons included books that were accessible to struggling first grade readers. Specific titles were selected and ordered according to the Reading Recovery leveling system. Titles were selected based on their use of high frequency words and decodable words with common rhyming patterns. The same books were used for all participants in each intervention phase. The researchers were able to examine whether systematic, explicit instruction would be effective with popular materials, the leveled books. The manipulative activities involved solid white, simple, san-serif letters and plain, one color magnetic boards. The intervention focused on a three step manipulative alphabetic word work format. The first step involved a brief introduction to the book followed by the students reading the book chorally, with the instructor providing assistance as needed. This part of the lesson was between 8-10 minutes in duration. The second part of the lesson provided explicit and systematic instruction in the alphabetic principle and decoding. Target words were selected from the book and students were taught how to segment the sounds in the words with manipulative letters, and blend the sounds together. This process attempted to ensure that blending and segmenting was concrete rather than abstract. For each lesson, approximately 25 manipulations were conducted. This part of the lesson was 12-15 minutes in duration. In the last part of the lesson, students reread the book chorally to allow for additional practice in meaningful connected text. This part of the lesson was between six to eight minutes. To check fidelity, the researchers observed each instructor implementing the intervention twice based on a checklist. Data was
collected as a baseline for each student and throughout the intervention. Following each intervention session, pseudoword decoding rate was measured for each student using a one minute probe. Data was analyzed by comparing percentages of the pseudoword decoding rate for each student from the baseline, to after lesson four, after lesson ten, and after the final lesson.

Results demonstrated that the nine students had substantially higher percentages of pseudowords read correctly by the fourth measurement after the onset of the intervention. On the baseline, students read an average of 46.5% of the pseudowords correctly. After ten lessons, students read an average of 86.5% of the pseudowords correctly. After the final lesson, students read an average of 88.4% of the pseudowords correctly.

After examining the results, the pseudoword reading rate changed gradually rather than dramatically after intervention began. The improvement in the participants’ pseudoword decoding rate demonstrated a functional relationship between instruction and decoding variables. The results implicated that instruction in fundamental decoding skills benefited beginning readers. The results also demonstrated the benefits of implementing an explicit intervention that included instruction with manipulative letters. Participants of this study demonstrated greater decoding skills, as evidenced by their reading of pseudowords.

Similar to the first study, Yeh and Connell (2008) also attempted to determine if instruction in phoneme segmentation and blending would influence students’ decoding abilities. Yeh and Connell (2008) attempted to determine if instruction that emphasized phoneme segmentation and blending would promote future reading ability more than rhyming or vocabulary activities. The researchers designed the study to evaluate whether children were more likely to develop phonemic awareness through direct instruction in phoneme segmentation and blending, rhyming activities, or vocabulary activities. The researchers hypothesized that all
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instruction and activities in this study would lead to phonemic awareness but phoneme segmentation and blending instruction would be the better predictor of early progress in learning to read. The independent variable present included three treatment groups: phoneme segmentation, rhyming, and vocabulary development. A total of 16 classrooms from Head Start centers were randomly assigned to these three groups. All of the centers used *The Creative Curriculum* (Dodge et al., 2002). Dependent variables included five subtests of the Phonological Awareness Test (Robertson & Salter, 1995). Letter sound knowledge included two graphemes subtests, decoding, rhyming discrimination, and rhyming production subtests. Letter sound knowledge was measured by presenting students letters individually and then prompting them to produce each sound corresponding to the letter. Decoding ability was measured by presenting students made up words and then prompted them to read each word. Rhyming was measured by the combined score of the rhyming discrimination and rhyming production subtests. The word identification task from the Woodcock-Johnson Psycho-Educational Battery-Revised (WJ-R; Woodcock & Johnson, 1989) test required students to read each word when presented with a printed word. The Peabody Picture Vocabulary Test, Third Edition (PPVT-III; Dunn & Dunn, 1997) assessed receptive vocabulary knowledge.

Participants of the study included one hundred and twenty-eight children. The children were aged 4 years and 3 months to 5 years and 2 months. These children were in 16 classrooms from three Head Start centers in Boston, Massachusetts. The children were mostly minority, 72% African-American, 18% Hispanic, 6% Caucasian, and 4% Asian. All of the participants were from low income families, which is consistent with Head Start eligibility criteria. They were characterized as non-readers, and pre-test measures indicated the participants had low levels of phonemic awareness. Head start centers were selected for inclusion in the study due to their
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willingness to participate and have classrooms randomly assigned to treatments. Within the
centers, all classrooms participated.

Classrooms were randomly assigned to one of three treatment groups by the researchers.
Teachers were informed of their assignment prior to receiving professional development in the
corresponding instructional treatment. Teachers received two separate two hour workshops for
their assigned treatment. One workshop was at the beginning of instruction and the other four
weeks later. Workshops consisted of presentations regarding instructional goals, philosophy and
strategies, and teachers received modelling and coaching regarding the assigned approach. The
three instructional treatments were implemented for 14 weeks, and instruction was
approximately 10.5 hours. Children were instructed in groups of 8-10 children for 20-25 minutes
twice per week. Teachers were observed once per week to confirm treatment fidelity. The
phoneme segmentation group used preplanned curriculum activities from the Phono-Graphix™
program (McGuinness & McGuinness, 1999) that emphasized phonemic spelling and oral
reading of real words using letter manipulatives. Teachers in this group focused on phoneme
segmentation, blending, and substitution in the context of spelling three letter words using
phonemes, manipulating the spelling to create new words, and reading short sentences based on
those words. Instruction was scaffolded with teachers modelling and exaggerating phonemes,
eliciting and reinforcing correct responses, and gradually withdrawing support as children
learned to match sounds and graphemes and sound out short words. The rhyming group was
exposed to instruction of specific preplanned rhyming activities that were selected from
Phonemic Awareness in Young Children: A Classroom Curriculum (Adams, Foorman, Lundberg
& Beeler, 1998). Children were instructed to provide a rhyming word when prompted with a
stimulus word and provide words with the same initial consonant. The later part of the
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curriculum transitioned to more advanced phoneme manipulation activities. Teachers in the vocabulary group pre-instructed new vocabulary, read books to children, would stop to explain the meanings of new words, emphasized repeated words, and reread stories once the vocabulary was explained. At the conclusion of the treatment instruction, children were assessed using the same measures as pre-test. The effect of the three treatment groups was analyzed through analysis of variance of post-test scores minus pre-test scores and compared to four measures. Phoneme segmentation, blending, deletion, and substitution measures were combined into one phonemic awareness measure. The letter-sound and decoding measures were combined into one measure, and the rhyming discrimination and production measures were combined into one measure. The PPVT vocabulary measure was the fourth measure analyzed. Weekly observational data and interview data were also collected and analyzed to assess treatment implementation.

Each treatment group demonstrated a significant gain from pre-test to post-test on the corresponding measure most closely associated with the treatment. The segmentation group demonstrated significant gains on the combined phonemic awareness measure, \( t(1,39) = 2.89, p < .006 \), and the combined letter-sound measure, \( t(1,39) = 3.002, p < .005 \). The vocabulary group demonstrated significant gains on the vocabulary measure, \( t(1,42) = 7.11, p < .001 \). The rhyming group demonstrated significant gains on the rhyming measure, \( t(1,43) = 4.85, p < .001 \). The primary research question involved the effects of the three treatments on the combined measure of phonemic awareness. The gains of the segmentation group were significantly greater than the gains of the rhyming \( (p < .003) \) and vocabulary group \( (p < .012) \). When the effect of treatment on the combined measure of letter-sound knowledge was examined, the gains of the segmentation group were significantly greater than the gains of the rhyming group \( (p < .013) \) but not the vocabulary group. The gain of the segmentation group \( [4.45] \) was larger than the gain of the
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vocabulary group [2.795]. The effect of treatment on the combined rhyming measure resulted in no significant differences in gains among the children of the rhyming group compared to the other two groups. There were also no significant differences in gains among treatments on the measure of vocabulary knowledge. The improvement of children in the vocabulary group was not significantly greater than the gains by the other two groups.

The results indicated that instruction that emphasized phoneme segmentation and blending was more effective in phonemic awareness development and letter-sound knowledge than instruction that emphasized either rhyming or vocabulary. Explicit, systematic instruction that emphasized phoneme segmentation and blending is more likely to promote phoneme segmentation skill as well as later reading ability. The results also indicated that children as young as four years old in an overwhelmingly economically disadvantaged, minority neighborhood can be taught phoneme segmentation, blending, and letter-sound relationships.

Similar to the first two studies, Allor, Gansle, and Denny (2006) studied the effects of incorporating a phoneme segmentation and blending intervention, however, these researchers used a game format to implement their intervention. Allor, Gansle, and Denny (2006) used a multiple baseline design to evaluate the effects of an intervention on phoneme segmentation fluency. The study contained two purposes. The first purpose was to demonstrate how teachers and paraprofessionals used curriculum based measurement to identify and evaluate the progress of six kindergarten students who were identified as having difficulty with phonemic awareness. The second purpose of the study was to evaluate the effectiveness of a specific phonemic awareness intervention that applied what is known about phonemic awareness in a direct format and that was easy to implement, and motivating, engaging, and interesting to young students. The independent variable present in this study was the phonemic awareness intervention Stop
and Go game that was designed to provide students with an opportunity to practice the skills of blending and segmenting phonemes. The game was part of a more complex intervention for teaching phonemic awareness and decoding that was used with struggling students (Allor & McCathren, 2004). The dependent variable present in this study included the use of two, one-minute subtests of Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2003). The phoneme segmentation fluency subtest of DIBELS was a standardized, individually administered test that assessed students’ ability to fluently segment three and four phoneme words into their individual phonemes. The nonsense word fluency subtest of DIBELS was a standardized, individually administered test that assessed students’ ability to read nonsense words by students saying a sound for each letter or reading the entire word.

The participants included six kindergarten students who were identified as at-risk for reading failure based on their performance on the DIBELS test in the middle of their kindergarten year. The selected students performed below established benchmarks for the middle of the year. Three of the participants were 5 years old at the time of the study, and three participants were 6 years old. Five of the participants were African American, and one was Caucasian. Four participants were male, and two were female. One of the participants received special education services for reading and math as well as occupational and physical therapy for physical disabilities. The study occurred in a small elementary school in a southern United States community that contained 230 children from kindergarten to second grade. The schools population included 74% African American, 25% Caucasian, and less than 1% Hispanic students. Ninety four percent of the students qualified for free or reduced lunch.

Five of the six participants were taken out of the classroom twice a day to participate in the intervention. One participant could only participate once a day due to time constraints. In the
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First session, the students played the Stop and Go Game with an emphasis on blending and the sessions lasted approximately 10 to 15 minutes. The game was conducted on an individual basis, with only one student and adult per session. During the second session, students played the game again with an emphasis on segmenting and then were assessed. The length of the sessions varied on the availability of the students and their stamina to continue the game. The intervention’s number of minutes per day ranged from 10 to 44 minutes with an average length of 25.8 minutes. Throughout the game, students practiced segmenting spoken words into their individual phonemes and blending individual phonemes into spoken words. Students were also exposed to small sets of letters and were assisted in pronouncing the most common sounds for the letters. Students needed to identify if the letter sounds were stop sounds such as /t/ or /d/, or continuous go sounds such as /s/ or /m/. When enough letters were drawn to make a simple consonant vowel consonant word, the tutor assisted students to blend the sounds to form the word or segment the word into individual sounds. When a letter card was drawn, the student was prompted to make the appropriate sound and move the card to the green or red traffic signal to signify the stop or go sound. The player moved their token two spaces for a go sound and one space for a stop sound. When a word was correctly blended, the player was allowed to move two spaces. During the game, instruction was explicit, with the tutor modeling correct responses, providing multiple opportunities for practice, and providing immediate corrective feedback. Game materials included two inch by three inch letter cards with letters consisting of two vowels and eight consonants, a laminated sheet with two line drawings of a traffic light, with the light circles in color, a simple winding path game board, and rubber vehicles for game tokens. In earlier intervention sessions, the tutor modeled stop sounds as sounds that could not be held over time, and go sounds as sounds that could be held over time. The researchers collected data daily using
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the phoneme segmentation fluency subtest of DIBELS. The DIBELS nonsense word fluency
subtest was administered once per week. Data was analyzed by comparing student performance
on the subtests to the end of the year benchmark score for kindergarten and how many
intervention sessions it took to reach the benchmark score.

Five of the six participants met the end of the year benchmark scores. The number of
intervention sessions prior to achieving benchmark performance varied among the participants
and ranged from 16 sessions to 45. The established benchmark score was 35 points. One
participant met the benchmark score after 16 intervention sessions, two participants after 23
sessions, one participant after 26, and one participant after 45 sessions. Three of the six
participants consistently exceeded the kindergarten benchmark score for phoneme segmentation
for the remainder of the study after achieving the initial benchmark score. The one participant
who did not meet the benchmark score still showed growth in an upward trend which indicated a
consistent pattern of acquisition.

All of the students that participated in the study and received an intervention in phonemic
awareness skills experienced considerable growth in their ability to segment phonemes in spoken
words which leads to faster responses to initial reading instruction. The study provided additional
evidence that individuals can use curriculum based measures of phonemic awareness to identify
students in need of intensive instruction in phonemic awareness and evaluate their progress. Data
supports the effectiveness of the game based intervention that was implemented by a
paraprofessional. The intervention was effective in building phonemic awareness skills for the
six participants.
Similar to the first three studies, Daly, Chafouleas, Persampieri, Bonfiglio, and LaFleur (2004) examined the effects of students learning to blend and segment phonemes as students combined phonemes to read words more effectively. The purpose of this study was to investigate whether teaching phoneme blending and segmenting skills would lead to generalized outcomes comparative to training that provided the same instructions for reading, the same number of opportunities to respond, and the same reward contingency but did not teach blending and segmenting skills necessary for generalization to occur. It was expected that participants would read more words in the phoneme blending condition than in the sight word condition. The independent variables consisted of an experimental condition and a control condition. The experimental condition involved phoneme blending in which the experimenters differentially reinforced segmenting phonemic units and blending those units using nonsense words. The control condition incorporated sight word instruction in which experimenters differentially reinforced accurate reading of nonsense words. The dependent variable was the cumulative number of real words mastered from a pool of unknown words. Mastery was based on a student reading a word correctly within five seconds for two consecutive sessions. Words were drawn from a variety of word lists and contained three or four phonemes. The words were used to assess the outcomes of instruction and were the generalization words, which was the target of instructional efforts.

The participants were two male first grade students in an urban Midwestern school district. Pseudonyms were used to protect the participants’ identity. Cyrus was 6 years, 2 months at the beginning of the study and was not receiving special education services at the time of the study. Peter was 7 years, 7 months at the beginning of the study and was receiving Speech Services as a student with a Speech and Language Impairment. Both students were referred
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because teachers were concerned that they demonstrated reading difficulties. Prior to participating in the study, Cyrus obtained a Standard Score of 79 with a mean of 100, and scored at the 8th percentile on the Broad Reading portion of the Woodcock-Johnson III Tests of Achievement (Woodcock, McGrew, & Mather, 2001). Peter acquired a Standard Score of 95 and scored at the 38th percentile.

An A/B/A/B experimental design was used to evaluate participants. For Cyrus, the sequence was sight word/phoneme blending/sight word/phoneme blending. For Peter, the opposite sequence was followed; phoneme blending/sight word/phoneme blending/sight word. An ongoing screening method was used to identify unknown words that could be used in the study as participants mastered previous unknown words. Once a word was read correctly, it was eliminated from the study. Once four experimental words were determined through the screening procedure, the first condition of experimental sessions began. Students were taught nonsense words and were measured with real (generalization) words. During all sessions, participants were taught four words. Only one experimental condition was implemented per session, and only one session per day. Sessions were approximately 10 minutes. The sight word condition was the control condition. Students were instructed to read nonsense words as a single response unit (e.g., deb). The researchers presumed that learning a single response unit would not aid in generalizing to the real elements with the same phonemic elements (e.g., bed). Each nonsense sight word was presented to the student individually as the experimenter read the word aloud. The student was then asked to repeat the nonsense word. Next, the student and experimenter read the word together. Then the student was directed to read the word two more times independently. If the student read the word incorrectly, the experimenter modeled the correct response, and the student was asked to repeat. All four words were instructed in the same way. The phoneme
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blending condition involved training the students to read all of the phonemes in the word (/t/ /i/ /s/) and to blend the sounds together to read the entire nonsense word (tis). Researchers expected that students would be able to generalize responding to real words (sit) due to their ability to blend individual phonemes. In this condition, students were exposed to one phoneme at a time on an index card for each word. The experimenter modeled correct reading of the phoneme, and asked the student to read each phoneme aloud. Next, the experimenter and student blended the sounds together to form a word. The process was repeated for all four words in a session. Then students were expected to read phonemes and blend sounds together two more times independently. If the student made an error at any time, the experimenter modeled the correct response, and then student was asked to repeat. After each session, both the control and experimental, the experimenter assessed student performance on real words and screened for additional unknown words to use in instruction. The participant read at least 12 real words during assessment. Four words had been previously assigned to the sight word condition, four to the phoneme blending condition, and four assessment only words. An independent observer listened to audiotape recorded sessions and scored for correctly read words for the session.

By the end of the initial sight word condition, Cyrus mastered one word. During the second phase of the sight word condition, he mastered no new words. At the end of the initial phoneme blending phase, Cyrus mastered 12 words and an additional 4 words by the end of the second phase. Peter mastered more words in both phases of phoneme blending than in sight word phases. Peter mastered 13 words by the end of the first phase of phoneme blending, and an additional 10 words by the end of the second phase. Peter mastered five words in the first phase of the sight word condition and four additional words by the end of the second phase. Cyrus mastered four sight word words during phoneme blending phases and zero phoneme blending
words during sight word phases. Peter mastered zero sight word words during phoneme blending phases and zero phoneme blending words during the sight word condition.

The results of this study indicated that participants generalized phoneme blending skills to real word combinations of phonemes as correctly read words. When under the control of nonsense whole words, generalized increases to real words containing all of the same phonemic units was not observed for both participants to a substantial degree. The study confirmed the importance of small, fine-tuned response repertoires to develop proficiency in reading. Both students were able to master more words in the phoneme blending condition than in the sight word condition. Peter mastered 23 phoneme blending words at the end of 39 experimental sessions. Cyrus mastered 19 phoneme blending words by the end of 53 experimental sessions. Peter was more responsive to the treatment and learned more words in less sessions. The results correlated with findings on the standardized norm-referenced test administered to the students before the study began, where Cyrus was at the 8th percentile and Peter was at the 38th. Not only was the generalization of responding to words directly tested, but the phoneme blending reading behaviors that were used to train the students can serve them as a generalization strategy. Using early literacy skills, such as phoneme segmentation and blending, and when trained to an acceptable level of proficiency, students can become more effective decoders when faced with new and challenging material.

Similar to the above studies, Daly, Johnson, and LeClair (2009) conducted a study to identify the effects of instruction on blending phonemes. Unlike the other studies, the researchers conducted a second experiment to evaluate the effects of implementing an individualized intervention for a student when classroom based instruction was not successful. Daly and LeClair (2009) examined the effects of a two experiment study in which experimental analyses of
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phoneme blending and segmenting skills were conducted with four first grade students. The purpose of this study was to determine the feasibility and results of leading experimental analyses of phoneme blending and segmenting skills for individual decision making. In the first experiment, intraindividual analyses were conducted to identify students’ response to classroom based instruction. The second experiment, a supplemental instructional intervention was provided for the student who was non-responsive to classroom-based instruction. The independent variable for the first experiment was classroom based instruction that included whole group, small group reading activities, and independent seatwork. The independent variable for the second experiment consisted of an individualized, supplemental instruction that was conducted by the researchers concurrently with classroom instruction. The dependent variable was the number of nonsense words read correctly per session. For the word to be counted as correct, the student had to read the word aloud accurately and within five seconds. The nonsense words used for the assessments were chosen according to the sounds associated with the themes in Houghton Mifflin (2006) lesson plans.

The participants included four first grade students that ranged from six to seven years old. The students attended an urban Midwestern elementary school and were nominated by two classroom teachers. None of the students were receiving special education services at the time the study was conducted. Teachers were instructed to nominate two students who were potentially at risk for reading difficulties and two students who were viewed as not at risk. Pseudonyms were used to protect the participants’ identity. The two students who were nominated as not at risk were Isaac, an African-American/Caucasian male, and Nadia, a Caucasian female. Anna and Chloe, both Caucasian females, were the two students nominated as at risk for reading difficulty.
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Screening was administered prior to each experimental analysis to assure students were not able to read the stimulus nonsense words before the study began. All nonsense words were presented to each student who was instructed to try to read each word aloud. Words read correctly were eliminated from the pool of words. The remaining nonsense words were presented again in a separate session for each student to read a second time. From the words that were incorrectly read twice, ten words per theme (Themes 4-7) were chosen for each student. Baselines were established for Themes 4-7 before teachers began teaching Theme 4 in the first experiment with all four students, and for Themes 8-10 before the teacher began teaching Theme 8 in the second experiment with Chloe. Each Theme was typically three weeks in duration. In experiment one, Themes 4, 5, 6, and 7 were taught sequentially. A new phonics skill was introduced each week for the Theme. Classroom instruction included large group instruction, which consisted of demonstrating the new phonics rule and students answering teacher questions. Small group reading activities included reading from the basal and answering comprehension questions. Independent seatwork required students to complete reading worksheets. The purpose for analysis in experiment one was to determine the degree to which students were benefitting from regular classroom instruction. The teachers were not instructed to change anything they were doing.

In experiment two, the experimental analysis was conducted with Chloe while her teacher sequentially taught Themes 8-10. Classroom instruction, assessment, and reinforcement conditions were the same as the first experiment. The researchers conducted individualized, supplemental instructional sessions simultaneously with classroom instruction. The letters taught in a given Theme were presented individually on index cards and Chloe practiced reading the letters by stating the phonemes in isolation and then in combination as a nonsense word. To
teach phonemes in isolation, the experimenter presented the letters individually, modeled the correct sounds, and then prompted Chloe to provide the correct sounds. The letters were then randomized, presented again, and Chloe was prompted to state the sounds one more time. If an error was made, the experimenter produced the sound and prompted Chloe to repeat correctly. To teach phonemes in combination as nonsense words, the experimenter randomly selected two consonants and a vowel from the pool of letters on flashcards, placed them in front of Chloe as a consonant-vowel-consonant pattern, modeled correct reading of the sounds, prompted Chloe to read the sounds in isolation, and then instructed Chloe to read the sounds together as a word. This step was repeated until no more phonemes remained in the pool, and then the process was followed two more times for all of the phonemes, but without experimenter modeling. During the first two weeks of a Theme, attempts were made to assess students with the words associated with that Theme at least three times each week. During the third week of instruction of a Theme, students were assessed across all of the Themes. Probing across themes continued until the conclusion of Theme 6 for Isaac, and Theme 7 for Nadia and Anna in experiment one. In experiment two, Chloe, the sole participant, was assessed until the conclusion of Theme 10. Classroom lessons were conducted in a group, while assessment sessions were performed individually with each student three times a week. Students could earn points for reading words correctly, and the points could be exchanged for small tangible items from a prize box. All sessions were audiotaped, and an interobserver scorer listened to the audiotapes and scored all word presentations as either correct or incorrect.

Experiment One results were as follows. Results for Isaac were characterized by increasing trends in Baseline (Themes 5 and 6), an increasing trend during Theme 4 instruction, improved levels of responding by the end of all instructional phases, and maintenance of
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responding for Themes 4 and 5. Isaac correctly read 7 words after Theme 4 as opposed to 4 words during baseline. He correctly read 9 words during Theme 5 as opposed to 3 words during baseline. He correctly read 6 words after Theme 6 and read zero correct words during baseline. Results for Nadia also demonstrated increasing trends in Baseline (Themes 5-7), increasing trends and improved performance levels during instruction for Themes 4, 5, and 7, and maintenance of elevated response levels for Themes 4 and 5. Nadia moved from 3 words correct during the baseline to 5 words during Theme 4, from 2 words to 9 words during Theme 5, from 1 word to 6 words during Theme 6, and zero words to 9 words during Theme 7. Results for Anna displayed more slight increases in Baseline than Isaac and Nadia, but demonstrated visible changes in trend for Themes 4, 5, and 7, and change in level for Theme 6 during classroom instruction. Anna also maintained elevated response levels across Themes 4-6. Anna moved from 3 words correct during the baseline to 7 words during Theme 4, from zero words to 10 words during Theme 5, from zero words to 2 words during Theme 6, and 2 words to 7 words during Theme 7. Chloe’s results displayed stable baselines and little to no improvement during classroom instruction and maintenance across all four themes. Chloe’s words read correct during Themes 4-6 remained the same at 2 words. Chloe moved from zero words correct during the baseline to 1 word correct during Theme 7. The results of experiment two were only for Chloe, as she required individualized instruction past Theme 7. Baseline data for Chloe for Theme 8 was stable and low, followed by a rapid change in level and trend during the instructional phase. Chloe moved from 1 word correct during baseline to 6 words correct during Theme 8. Chloe’s responding remained elevated relative to Baseline and stable during maintenance. Baseline data for Theme 9 demonstrated a low and stable trend with a slight increase observed during the last two sessions. Theme 9 maintenance data remained high and very stable. Chloe moved from 2
words correct during baseline to 6 words correct during Theme 9. Baseline data for Theme 10 showed an initially low and gradually increasing trend across the data collection period. An increasing trend in responding occurred during Theme 10 instruction. Theme 10 maintenance data was stable and at a level that exceeded the level achieved during instruction and intervention. Chloe moved from 5 words correct during baseline to 9 words correct during Theme 10 instruction.

A single case design paired with measurements of generalized performance increases over time in response to instruction (experiment one) and instruction plus a supplemental intervention (experiment two) allowed for differentiating levels of students’ response. This method proved sensitive to identifying individual differences between students and closely resembled a universal screening as part of Response to Intervention to identify students at risk for academic failure. The results of Experiment One confirmed differing levels of responsiveness to classroom instruction, repeated assessment, and a reinforcement contingency across students. Isaac and Nadia’s results were the most promising, while Anna’s results indicated performance changes that correlated with the beginning of instruction for each Theme and were maintained after the conclusion of the Theme. Chloe’s performance did not improve in the context of the instruction/assessment/reinforcement contingencies. This indicated that the method used in this study was able to identify the differing levels of responding to instruction across students. This also indicated that a particular student, Chloe, needed more intensive instruction if she was able to be successful with learning to blend phonemes into words. The second experiment indicated that Chloe was responsive to a simple, supplemental intervention designed to increase learning with stimuli, phonemes, while being instructed simultaneously in the classroom.
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The five studies in this section proved the importance of incorporating phoneme segmentation and blending skills in reading instruction. When students are unsuccessful with classroom based instruction in decoding, an explicit intervention of segmenting and blending phonemes is essential. The study by Pullen, Lane, Lloyd, Nowak, and Ryals (2005) confirmed that the skill of blending is a fundamental decoding skill that will benefit beginning readers. The study also confirmed that the use of manipulative letters in an explicit intervention will result in greater decoding skills. The second study by Yeh and Connell (2008) verified that explicit, systematic instruction that emphasized phoneme segmentation and blending promotes phonemic awareness as well as predicts later reading ability. The third study by Allor, Gansle, and Denny (2006) confirmed that an intervention in phonemic awareness skills lead to considerable growth in students’ ability to segment phonemes in spoken words which leads to faster responses to initial reading instruction. The fourth study by Daly, Chafouleas, Persampieri, Bonfiglio, and LaFleur (2004) established that instruction in phoneme blending skills lead students to develop proficiency in reading, especially when using decodable words. The fifth study by Daly, Johnson, and LeClair (2009) confirmed that when regular classroom instruction is not enough, students are responsive to a simple, supplemental intervention designed to increase learning with stimuli, phonemes, while being instructed simultaneously in the classroom. The researchers of the five studies confirmed that phonemic awareness skills were essential in the accurate decoding of words, specifically segmenting and blending phonemes. Students lacking phonemic awareness skills would benefit from an intervention that targeted segmenting and blending phonemes.

Conclusion

The research studies discussed in this chapter supported the importance of word recognition in regards to reading ability. Word recognition skills and strategies were essential in
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reading words accurately, especially when encountered with an unknown word. Furthermore, students who were not skilled in word recognition required an explicit intervention that focused on their specific word recognition needs. The study by Cummings, Dewey, Latimer, and Good (2011) confirmed that Nonsense Word Fluency progress predicted Oral Reading Fluency for the end of first grade. Noltemeyer, Joseph, and Kunesh (2013) confirmed that small group phonics intervention was effective at improving words recalled immediately after an instructional period, especially when teacher modeling, opportunities for students to respond, and teacher feedback is provided. Cohen and Brady (2011) confirmed that an intervention that integrated teaching strategies based on vowel pattern analysis and children’s literature increased word reading accuracy. The study by Ayala and O’Connor (2013) verified positive effects of video self-modeling on improving decoding skills and sight word recognition for children at risk for, or with reading disabilities. The study by Giess, Rivers, Kennedy, and Lombardino (2012) established that the phonics based training intervention significantly increased the phonological awareness, word recognition, and spelling abilities of older students. Some students will require an intervention in phonological awareness to increase their ability to manipulate sounds of words. An intervention must include explicit, systematic instruction in phonological awareness skills. When a proper intervention is administered, gains of phonological awareness skills and increased word recognition abilities result. Lane, Fletcher, Carter, Dejud, and DeLorenzo (2007) established that a phonological awareness intervention resulted in gains of word attack skills. The study by Ryder, Tunmer, and Greaney (2007) confirmed that a phonemically based intervention was successful in improving the phonological awareness skills, decoding ability, and context-free word recognition skills of struggling readers. Research further demonstrated that obtaining the decoding skills of segmenting and blending results in greater word recognition
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ability. Pullen, Lane, Lloyd, Nowak, and Ryals (2005) confirmed that the decoding skill of blending will benefit beginning readers, especially when the use of manipulative letters was incorporated into an explicit intervention. The study by Yeh and Connell (2008) verified that explicit, systematic instruction that emphasized phoneme segmentation and blending promotes phonemic awareness as well as predicts later reading ability. The study by Allor, Gansle, and Denny (2006) confirmed that an intervention in phonemic awareness skills lead to considerable growth in students’ ability to segment phonemes in spoken words which leads to faster responses to initial reading instruction. The study by Daly, Chafouleas, Persampieri, Bonfiglio, and LaFleur (2004) established that instruction in phoneme blending skills lead students to develop proficiency in reading, especially when using decodable words. The fifth study by Daly, Johnson, and LeClair (2009) confirmed that when regular classroom instruction is not enough, students are responsive to a simple, supplemental intervention designed to increase learning with stimuli, phonemes, while being instructed simultaneously in the classroom. The researchers confirmed that phonemic awareness skills were essential in the accurate decoding of words, specifically segmenting and blending phonemes. Skilled readers who are effective in decoding words will be able to accurately read more words.
Participants were involved in a study that explored the effects of teaching students how to blend and segment words to increase their decoding and word recognition abilities. The main purpose of this chapter is to describe the procedures that were used during the study. This chapter will provide a description of the sample population that was used in this study, the description of procedures used during the intervention instruction, as well as a description of data collection and analysis.

**Description of Sample Population**

Five students were chosen to participate in this study. All participants were chosen from the researcher’s first grade regular education classroom. Participants were identified using archival data from the spring of their Kindergarten year. End of the year Fountas and Pinnell (2008) reading levels as well as Phonological Awareness Literacy Screening (PALS; Invernizzi, Juel, Swank, Meier, 2013) scores were used to determine readers who were performing below grade level or developmental benchmarks as set by the school district. Of the participants who were considered for the study, all were able to participate and returned signed consent forms. Participants included two males and three female students. The age of students ranged from six years two months to six years ten months, with a mean age of 6.24 years. Four of the five participants were Caucasian and one was Asian. Three of the five participants had an IEP for Speech and Language Services at the time of the study that specified they participate in normal classroom activities. The speech pathologist provided services in their regular education classroom and none of the students were instructed in a separate location. Additional demographic and socio-economic status information was not available to the researcher.
Description of Procedures Used

After analyzing pretest data, instruction was designed around common phonic elements and letter sounds that students had not mastered. Initial and final consonants were secured by most students, however, short vowels were used and confused by all participants and digraphs were unknown. The first week of the study was used to collect pretest data. After analyzing data, instruction was designed to target the five short vowels (a, e, i, o, and u) and three digraphs (sh, ch, and ck). Instruction based on the needs of students began the second week of the study. Explicit instruction in blending and segmenting phonemes was incorporated into intervention instruction each day of the study. Blending phonemes entailed the reader blending, or combining the individual sounds of each word. Segmenting phonemes required the reader to segment, or separate the individual sounds of each word. Often students would segment the sounds, and blend the sounds together to decode, or read the word. Students received daily instruction for 30 minutes per day for six weeks. Students did not miss core instruction; the study was conducted during regularly scheduled guided reading group time. The intervention group received the most amount of teacher time of the reading groups. The six weeks of instruction included targeted phonic elements per week (e.g., one short vowel sound with mixed digraphs) for the first five weeks, and concluded with a review of the five short vowels and three digraphs during week six. Each day of the week had specific activities that remained the same throughout the instruction period. For example, every Monday had the same activities regardless of the phonic element. Instruction on Mondays and Wednesdays began with a flashcard review where students provided the letter name and sound for each card that was presented (see Appendix A). Then, students used Phoneme Grapheme Mapping (Grace, 2007) to segment and blend the sounds of words provided by using tiles to represent the sounds that were heard. Students then wrote the sounds
they heard one-by-one by moving the tile, and writing the corresponding sound (see Appendix A). Instruction then concluded with students reading decodable word cards that contained the specific pattern that was targeted for the week (see Appendix A). Instruction on Tuesdays and Thursdays began with a flashcard review where students provided the letter name and sound for each card presented. Students then created words containing the target pattern using letter cards (see Appendix A). Students began by segmenting the sounds they heard and moved one letter card towards them one at a time. The word was then blended orally very slowly and then quickly and students were required to slide their finger under the word as they read. Only the letters that were used that day were provided for students to choose. Next, students read a decodable text that contained the target pattern (see Appendix A). When students encountered an unknown word, they were instructed to blend the sounds together to decode the word. To end instruction, students wrote words in their journal when prompted that contained the phonic pattern and wrote a sentence that was presented by the researcher (see Appendix A). Written journal entries were used by the researcher as an informal assessment, which was not recorded. Instruction on Fridays began with a flashcard review where students provided the letter name and sound for each card that was shown. A picture or word sort followed. Picture sorts were used the first five weeks as students sorted picture cards to locate words that contained the targeted short vowel. During the final week, students sorted word cards to accurately sort words according to the short vowel pattern. Progress monitoring occurred each Friday and required approximately two minutes per student. The Aimsweb Nonsense Word Fluency (Aimsweb, 2012) and Aimsweb Phoneme Segmentation Fluency (Aimsweb, 2012) probes were used to progress monitor weekly. While students waited for their turn, they completed extension worksheets that contained the targeted pattern for the week. The sixth week worksheet contained the five short vowels and served as a
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review. The eighth week of the study was used to collect posttest data for each student. Data was recorded on the corresponding record keeping sheets that accompanied the programs that were used. All assessments were administered individually except for the Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012), and all assessments were administered as a pre and posttest. Participants were required to read words in list formats, provide phonemes for given words, and spell words on the spelling inventory when prompted.

**Description of Data Collection**

This study utilized a variety of informal assessments to collect data that demonstrated participants’ knowledge of high frequency words, ability to decode real and nonsense words, and spell orally dictated word patterns. The assessments included the Qualitative Reading Inventory-5 Word Lists (QRI-5; Leslie & Caldwell, 2011), Fountas and Pinnell High Frequency Word Lists (Fountas & Pinnell, 2008), Aimsweb Nonsense Word Fluency measure (Aimsweb, 2012), Aimsweb Phoneme Segmentation Fluency measure (Aimsweb, 2012), Road to Reading Levels Assessment (Blachman & Tangel, 2008), and Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012). The QRI-5 Word Lists were used as both a pretest and posttest. The QRI-5 is an informal assessment that is utilized to identify a reader’s reading level according to an independent, instructional, or frustration level (Leslie & Caldwell, 2011). The word lists are utilized by the researcher to determine a student’s ability to read words at increasing levels of difficulty. The researcher began with the pre-primer level and assessed until frustration for each student. According to the QRI-5 manual, the frustration level for a word list is when the student reads fewer than 70% of the words correctly on that list (Leslie & Caldwell, 2011). The Fountas and Pinnell Word Lists (Fountas & Pinnell, 2008) were also used in a similar way to gain information about the participants’ knowledge of high frequency words.
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and the lists were administered as a pretest and posttest. The Nonsense Word Fluency (NWF; Aimsweb, 2012) measure required students to read non-real words in one minute by stating the individual sounds or entire word to assess participants’ decoding ability. The NWF was used as a pretest, posttest, and used to monitor weekly progress. The Phoneme Segmentation Fluency (PSF; Aimsweb, 2012) measure required students to orally segment sounds in words in one minute. The PSF was used as a pretest, posttest, and used to monitor weekly progress. A Road to Reading Levels Assessment (Blachman & Tangel, 2008) was administered as a pretest and posttest. This assessment was utilized to measure students’ ability to decode words at varying levels (closed syllables, closed syllables with digraphs and blends, final e syllable, vowel teams, vowel +r, and consonant +le). A Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012) was also administered as a pretest and posttest. A feature analysis was used after the pretest to examine the students’ ability to encode words from an oral list and determine areas that needed intervention. A feature analysis was used to guide the researcher to determine the spelling stage for each student. Features are common parts of the word, such as initial and final consonants, short vowels, digraphs, and blends. All posttest data was analyzed and compared to the pretest data to determine the intervention’s effectiveness.

Summary

Participants were involved in a study that explored the effects of teaching students how to blend and segment words to increase their decoding and word recognition abilities. Five participants were chosen from the researcher’s first grade regular education classroom and were chosen based on their archival data from the end of their Kindergarten year. Intervention procedures lasted for six weeks and contained instruction patterns. Each day of the week followed a specific outline and was the same each week regardless of the phonic element that
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was presented. After collecting and analyzing pretest data, an intense focus on short vowel patterns was selected as the intervention focus. Six informal assessments were used to collect pretest and posttest data to determine the intervention’s effectiveness. Two informal one minute test probes were used to monitor weekly progress of the participants. The following chapter will examine the effectiveness of the intervention using the pretest and posttest data that was gathered during the study.
CHAPTER FOUR: RESULTS

This eight-week research study examined the effects of a six-week intervention in blending and segmenting phonemes and its overall effect on students’ word recognition. The study began with a week of pretest data collection. The researcher utilized six informal assessments that demonstrated participants’ knowledge of high frequency words, ability to decode real and nonsense words, and spell orally dictated word patterns. The assessments included the Qualitative Reading Inventory-5 Word Lists (QRI-5; Leslie & Caldwell, 2011), Fountas and Pinnell High Frequency Word Lists (Fountas & Pinnell, 2008), Aimsweb Nonsense Word Fluency measure (Aimsweb, 2012), Aimsweb Phoneme Segmentation Fluency measure (Aimsweb, 2012), Road to Reading Levels Assessment (Blachman & Tangel, 2008), and Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012). The six-week intervention then began which focused on blending and segmenting phonemes to support overall word recognition. The six weeks of instruction included targeted phonic elements per week (e.g., one short vowel sound with mixed digraphs) for the first five weeks, and concluded with a review of the five short vowels and three digraphs during week six. Instruction included consonant and vowel flashcard review, Phoneme Grapheme Mapping (Grace, 2007), reading decodable word cards, making words with letter cards, reading a decodable text, writing lists of words and a dictated sentence that contained the targeted phonic pattern, picture and word sorts, and a phonics worksheet that contained the targeted phonic pattern for the week (see Appendix A). After the intervention concluded, the researcher collected posttest data during week eight with all students using the same measures as the pretest. The results of the measures are presented in this chapter.
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Data Analysis

Students were assessed by the researcher using six different measures. The first measure that was utilized was the QRI-5 Word Lists (Leslie & Caldwell, 2011). The QRI-5 Word Lists were individually administered to each student and were designed to provide information regarding the conditions that students can identify words successfully and the conditions that seem to result in unsuccessful word identification (Leslie & Caldwell, 2011). The Pre-Primer 1 word list contained 17 words and the subsequent lists contained 20 words. Words were selected from the QRI-5 passages with the same level of readability. The word lists were designed by Leslie and Caldwell (2011) to assess accuracy of word identification, assess speed and automaticity of word identification, and to determine a starting point to read the initial passage. The researcher used the word lists to assess the accuracy, speed, and automaticity of word identification for each student. Students were first presented with the Pre-Primer 1 list. Students scored at an independent, instructional, or frustration level depending on the number of words that were read correctly. On the Pre-Primer 1 word list, 15-17 words read correctly was considered independent, 12-14 words was considered instructional, and less than 12 words read correctly was considered frustration. On the subsequent lists, 18-20 words read correctly was considered independent, 14-17 words was instructional, and less than 14 words was frustration (see Appendix B). When a student scored at the independent or instructional level, they read the next list. Students were assessed until they reached frustration.

The pre-assessment results for the QRI-5 Word Lists indicated that Student One read eight words correctly on the Pre-Primer 1 Word List and scored at a frustration level. Student Two read six words correctly on the Pre-Primer 1 Word List and scored at a frustration level. Student Three read 16 words correctly on the Pre-Primer 1 Word List and scored at an
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independent level, read 14 words correctly on the Pre-Primer 2/3 Word List and scored at an instructional level, and read 10 words correctly on the Primer Word List and scored at a frustration level. Student Four read 12 words correctly on the Pre-Primer 1 Word List and scored at an instructional level, and read six words correctly on the Pre-Primer 2/3 Word List and scored at a frustration level. Student Five read six words correctly on the Pre-Primer 1 Word List and scored at a frustration level. The mean of the pretest was 9.6 words read correctly on the Pre-Primer 1 Word List (see Figure 1).

![QRI Word Lists](image)

*Figure 1. Pretest and posttest results for the QRI-5 word lists*

The posttest results of the QRI-5 Word Lists suggested that the intervention increased the amount of words read correctly for all students. On the posttest, Student One and Student Two read 17 words correctly on the Pre-Primer 1 Word List and scored at an independent level, and read 11 words correctly on the Pre-Primer 2/3 Word List and scored at frustration. Student One
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had an increase of nine words read correctly on the Pre-Primer 1 Word List. Student Two had an increase of 11 words read correctly. Student Three read 17 words correctly on the Pre-Primer 1 Word List and scored at an independent level, with an increase of one word read correctly. Student Three read 19 words correctly on the Pre-Primer 2/3 Word List and scored at an independent level, with an increase of five words. Student Three read 17 words correctly on the Primer Word List and scored at an instructional level, with an increase of seven words, and read 12 words correctly on the First grade list and scored frustration. Student Four read 17 words correctly on the Pre-Primer 1 Word List and scored at an independent level, with an increase of five words, and read 12 words correctly on the Pre-Primer 2/3 Word List and scored frustration with an increase of six words read. Student Five read 15 words correctly on the Pre-Primer 1 Word List and scored at an independent level, with an increase of nine words, and read seven words correctly on the Pre-Primer 2/3 Word List and scored frustration. The mean of the posttest was 16.6 words read correctly on the Pre-Primer 1 Word List, and the pretest mean was 9.6 words. The mean increased by seven words read correctly (see Figure 1).

A one-tail dependent $t$-test was used to test the researcher’s hypothesis that students would improve on the QRI-5 Word Lists posttest assessment as compared to their pretest scores. There was a significant difference in the pretest scores ($M=9.6$) and the posttest scores ($M=16.6$); $t(5), p=0.0086, p<01$. These results suggested that the intervention was successful in improving students’ word recognition abilities.

The second measure that was utilized was the Fountas and Pinnell Word Lists, formally referred to as the Where-to-Start Word Test (Fountas & Pinnell, 2008). The assessment is comprised of a series of lists that become increasingly difficult. The lists are organized by grade level and designed to assist teachers in approximating a beginning point for leveled texts.
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(Fountas & Pinnell, 2008). As stated in the directions, first grade students began with the Beginning list. This assessment was administered individually to each student. The researcher instructed each student to read the list of words before them, beginning with the Beginning list (see Appendix C). Correct responses were recorded with a check mark, and incorrect responses were written next to the word. If a word was not attempted, the space was left blank. Twenty words were on each list, when a student read 16 or more words correctly they began the next level. When a student read less than 16 words correctly on a list, the assessment ended.

The pretest results indicated that Student One read 14 words correctly on the Beginning list and the assessment ended. Student Two read 16 words correctly on the Beginning list and two words correctly on the Level 1 list. Student Three read 20 words correctly on the Beginning list, 17 words correctly on the Level 1 list, and 12 words correctly on the Level 2 list. Student Four read 19 words correctly on the Beginning list and nine words correctly on the Level 1 list. Student Five read 13 words correctly on the Beginning list and the assessment ended. The mean of the pretest was 16.4 words read correctly on the Beginning list, and 9.3 words read correctly on the Level 1 list (see Figure 2).
The posttest results of the Fountas and Pinnell Word Lists suggested that the intervention increased the amount of words read correctly for all students. Student One read 20 words correctly on the Beginning list, an increase of six words, 16 words correctly on the Level 1 list, and seven words correctly on the Level 2 list. Student Two read 20 words correctly on the Beginning list, an increase of four words, 16 words correctly on the Level 1 list, an increase of 14 words, and nine words correctly on the Level 2 list. Student Three read 20 words correctly on the Beginning list, with no increase in words read due to reading the highest amount possible on the pretest. Student Three read 20 words correctly on the Level 1 list, with an increase of three words, 16 words correctly on the Level 2 list, with an increase of four words, and six words correctly on the Level 3 list. Student Four read 20 words correctly on the Beginning list, an increase of one word, 18 words correctly on the Level 1 list, an increase of nine words, and eight words correctly on the Level 2 list. Student Five read 19 words correctly on the Beginning list,
an increase of six words, and 13 words correctly on the Level 1 list. The mean of the posttest for the Beginning list was 19.8 words read correctly. The mean increased by 3.4 words read correctly. The mean of the posttest for the Level 1 list was 16.6 words read correctly. The mean increased by 7.3 words read correctly. The mean of the posttest for the Level 2 list was 10 words read correctly. Not enough data was obtained from the pretest for the Level 2 list to compare to the posttest mean (see Figure 2).

A one-tail dependent t-test was used to test the researcher’s hypothesis that students would improve their word recognition abilities on the Fountas and Pinnell Word Lists posttest assessment as compared to their pretest scores. There was a significant difference in the Beginning list pretest scores ($M=16.4$) and the posttest scores ($M=19.8$); $t(5), p=0.0265, p<05$. There was not a significant difference in the Level 1 pretest scores ($M=9.3$) and the posttest scores ($M=16.6$); $t(5), p=0.0561, p<05$. Despite one level demonstrating a significant difference and the other not, the results continued to suggest that the intervention was successful in improving students’ word recognition abilities.

The third measure that was utilized was the Aimsweb Nonsense Word Fluency probe (Aimsweb, 2012). This measure was administered individually to each student. Students were required to state each sound or the whole word in non-real words for one minute. Non-real words were either in a vowel-consonant or consonant-vowel-consonant pattern, such as nim. Students could correctly say nim, or segment the sounds individually and produce /n/ /i/ /m/. One point was recorded for each sound that the student correctly produced in one minute. When the entire word was read correctly, the student earned a point for each letter in the word. The highest possible total was 220 or 221 sounds (see Appendix D). The researcher recorded any errors.
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Errors consisted of substitutions, omissions, mispronunciations, or if a student struggled with a letter sound for more than three seconds.

The pretest results of the Nonsense Word Fluency probe demonstrated that Student One produced 20 correct sounds. Students 2 and 5 produced 16 correct sounds. Student Three produced 68 correct sounds. Student Four produced 30 correct sounds. The mean of the pretest was 30 sounds produced correctly on the Nonsense Word Fluency probe (see Figure 3).

![Aimsweb Nonsense Word Fluency](image)

*Figure 3. Pretest and posttest results for the Aimsweb nonsense word fluency probe*

The posttest results of the Nonsense Word Fluency probe indicated that the intervention increased the amount of sounds read correctly for non-real words for all students. Student One produced 58 sounds correctly with an increase of 38 sounds. Student Two produced 60 sounds correctly with an increase of 44 sounds. Student Three produced 106 sounds correctly with an increase of 38 sounds. Student Four produced 91 sounds correctly with an increase of 61 sounds. Student Five produced 52 sounds correctly with an increase of 36 sounds. The mean of the
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posttest for the Nonsense Word Fluency probe was 73.4 sounds produced correctly. The mean increased by 43.4 sounds (see Figure 3).

A one-tail dependent $t$-test was used to test the researcher’s hypothesis that students would improve their decoding abilities on the Nonsense Word Fluency probe posttest assessment as compared to their pretest scores. There was a significant difference in the pretest scores ($M=30$) and the posttest scores ($M=73.4$); $t(5)$, $p=0.0003$, $p<0.01$. These results suggested that the intervention was successful in improving students’ abilities to decode unfamiliar words by providing the accurate letter sounds.

The fourth measure that was informally assessed was the Aimsweb Phoneme Segmentation Fluency probe (Aimsweb, 2012). On this assessment the students were required to segment and state the sounds in words that were presented orally by the researcher. One point was awarded for each sound segment that was produced correctly in one minute. Students were assigned credit for each correct sound segment, even if they did not segment the word to the phoneme level. Credit was also recorded for complete, incomplete, and overlapping segmentation. A total of 97-99 sounds were on each assessment (see Appendix E). Errors recorded by the researcher included omissions, no segmentation, and segment mispronunciation. No segmentation occurred when the student repeated the entire word.

The pretest results of the Phoneme Segmentation Fluency probe indicated that Student One produced 25 phoneme segmentations, Student Two produced 40 phoneme segmentations, Student Three produced 39 phoneme segmentations, Student Four produced 34 phoneme segmentations, and Student Five produced 28 phoneme segmentations. The mean of the pretest
was 33.2 phoneme segmentations produced correctly on the Phoneme Segmentation Fluency probe (see Figure 4).

![Aimsweb Phoneme Segmentation Fluency](image)

**Figure 4.** Pretest and posttest results for the Aimsweb phoneme segmentation fluency probe

The posttest results of the Phoneme Segmentation Fluency probe indicated that the intervention increased the amount of phonemes segmented correctly for all students. Student One produced 79 phoneme segmentations with an increase of 54 segmentations. Student Two produced 93 phoneme segmentations with an increase of 53 segmentations. Student Three produced 60 phoneme segmentations with an increase of 21 segmentations. Student Four produced 80 phoneme segmentations with an increase of 46 segmentations. Student Five produced 74 phoneme segmentations with an increase of 46 segmentations. The mean of the posttest for the Phoneme Segmentation Fluency probe was 77.2 sounds segmented correctly. The mean increased by 44 sounds segmented correctly (see Figure 4).
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A one-tail dependent \( t \)-test was utilized to test the researcher’s hypothesis that students would improve their phonological awareness abilities on the Phoneme Segmentation Fluency posttest assessment as compared to their pretest scores. There was a significant difference in the pretest scores \((M=33.2)\) and the posttest scores \((M=77.2); t(5), p=0.0009, p<01.\) The results suggested that the intervention was successful in improving students’ abilities to segment phonemes by providing the accurate phonemes after a word was orally received.

The fifth measure that was utilized was the Road to Reading Levels Assessment (Blachman & Tangel, 2008). This assessment was administered individually to each student and contained six levels (Red, Orange, Yellow, Green, Blue and Purple) with 20 words for each level. Each level is separated into one of the six syllable patterns with the most common phonetic elements. The following patterns correspond with the colored levels above: closed syllables, closed syllables with digraphs and blends, final “e” syllables, vowel team syllables, vowel + r syllables, and consonant + le words. The Levels Assessment Recording Form (see Appendix F) was used to score and record each student’s oral reading of the words. The researcher noted any errors performed by the students and later evaluated the errors once the assessment was completed. The assessment began with the Red level and contained closed syllable words with short vowels. The level was considered as “passed” if a student read 80% of the words correctly, or 16 of the 20 words. The student then began the next level, Orange, followed by Yellow. The assessment was administered until the students received a score that was less than 80%.

The pre-assessment results for the Red Level of the Road to Reading Levels Assessment indicated that Student One read nine words correctly with 45% accuracy. Student Two read 10 words correctly with 50% accuracy. Student Three read 15 words correctly with 75% accuracy. Student Four read 13 words correctly with 65% accuracy. Student Five read 12 words correctly
with 60% accuracy. The mean of the pretest was 11.8 words read correctly and 59% (see Figure 5). During the pretest, none of the students began the next level, Orange, that contained closed syllables with digraphs and blends because the percentage was below 80 the level needed for advancement.

![Road to Reading Levels Assessment](image)

*Figure 5. Pretest and posttest results for the Road to Reading Levels assessment*

The posttest results of the Road to Reading Levels Assessment confirmed that the intervention increased the amount of words read correctly for all students. On the Red Level posttest, Students 1, 2, and 4 read 18 words correctly with 90% accuracy. Student Three read 19 words correctly with 95% accuracy. Student Five read 17 words correctly with 85% accuracy. The mean of the posttest was 18 words read correctly with 90% accuracy on the Red Level. The mean increased by 6.2 words read correctly and a mean increase of 31% (see Figure 5). All students read with word accuracy above 80% and proceeded to the next level, Orange, during the
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administration of the posttest. On the Orange Level posttest, Students 1 and 3 read 18 words correctly with 90% accuracy. Student Two read 17 words correctly with 85% accuracy. Student Four read 16 words correctly with 80% accuracy. Student Five read 19 words correctly with 95% accuracy. The mean was 17.6 words read correctly and could not be compared to a pretest mean (see Figure 5). All students read with word accuracy above 80% on the Orange Level posttest and proceeded to the next level, Yellow. Student Three read six words correctly with 30% accuracy. Students 2 and 4 read three words correctly with 15% accuracy. Student Five read two words correctly with 10% accuracy. Student One read one word correctly with 5% accuracy. The assessment was discontinued for all students after the Yellow Level. The mean was three words read correctly (see Figure 5).

A one-tail dependent t-test was used to test the researcher’s hypothesis that students would improve their ability to read decodable words with common phonic patterns on the Red Level posttest assessment as compared to their pretest scores. There was a significant difference in the pretest scores ($M=11.8$) and the posttest scores ($M=18$); $t(5), p=0.0015, p<01$. The results suggested that the intervention was successful in improving their decoding and word recognition abilities, specifically with decodable words.

The sixth and final measure that was utilized was the Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012). The researcher used the measure to guide developmental word study instruction through the assessment of students’ spelling. The Primary Spelling Inventory and Feature Guide were used with this group of students, and the assessment was administered to the five students at the same time. This list was comprised of 26 words and used with students in grades Kindergarten to Three. The list contained words that ranged from emergent to early syllables and affixes spelling. Students’
knowledge of spelling could range from scribbles on the page and knowing that speech can be written, but does not understand the process the Emergent Stage, to a more advanced word knowledge of English the Early Syllables and Affixes Stage. The words on the spelling inventory were ordered by difficulty. The researcher decided to end the assessment after the 13th word, and only administered half of the assessment due to the difficulty of spelling patterns presented to the students with which they did not have previous exposure. A feature guide was then used to determine the orthographic features the students would study and examined the quality of students’ spelling attempts (see Appendix G). Checkmarks were placed next to the features the students spelled correctly and totaled for each stage of spelling development. A total of 33 feature points and 13 words spelled correctly were possible. Features included initial consonants, final consonants, short vowels, digraphs, blends, and long vowel patterns.

The pretest results of the Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012) indicated that Student One spelled six words correctly and acquired 23 feature points. Student Two spelled four words correctly and acquired 23 feature points. Student Three and Student Four spelled six words correctly and acquired 26 feature points. Student Five spelled four words correctly and acquired 22 feature points. Students 1, 2, and 5 scored in the middle Letter Name-Alphabetic spelling stage. Students 3 and 4 scored in the late Letter Name-Alphabetic spelling stage. The mean of the pretest was 5.2 words spelled correctly and 24 feature points (see Figure 6).
The posttest results indicated that all students spelled seven words correctly and acquired 27 feature points. All of the students scored in the late Letter Name-Alphabetic to early Within Word Pattern spelling stages. The mean of the posttest was 7 words spelled correctly and 27 feature points. The mean increased by 1.8 words spelled correctly and three feature points (see Figure 6).

A one-tail dependent $t$-test was used to test the researcher’s hypothesis that students would improve their ability to spell words correctly and gain more feature points on the Primary Spelling Inventory posttest assessment as compared to their pretest scores. There was a significant difference in words spelled correctly in the pretest scores ($M=5.2$) and the posttest scores ($M=7$); $t(5)$, $p=0.0106$, $p<0.05$. There was also a significant difference in feature points in the pretest scores ($M=24$) and the posttest scores ($M=27$); $t(5)$, $p=0.0115$, $p<0.05$. The results suggested that the intervention was successful in improving students’ spelling abilities,
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specifically with breaking words down by their features and stretching the word out to include all of the sounds.

Conclusion

Throughout this chapter, the research data that was collected and analyzed was explained and supported the research questions: What effect does word recognition have on reading performance? What effect does phonological awareness have on decoding? What effect does blending and segmenting have on a student’s ability to decode? The data that was collected for this action research project through the use of pretesting, progress monitoring, and posttesting demonstrated that the explicit intervention in blending and segmenting phonemes in words was successful in improving word recognition and overall reading performance. The QRI-5 Word Lists (Leslie & Caldwell, 2011) and Fountas and Pinnell Word Lists (Fountas & Pinnell, 2008) results suggested that after a six week intervention, students increased their ability to recognize additional words. In addition, students also increased their ability to segment phonemes, an area of phonological awareness, as demonstrated by the results of the Phoneme Segmentation Fluency assessment (Aimsweb, 2012). Through this gain in phonological awareness, students were then able to decode more words as confirmed in the results of the Nonsense Word Fluency (Aimsweb, 2012) assessment and the Road to Reading Levels Assessment (Blachman & Tangel, 2008). Further, the Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012) results also suggested an improvement in matching orthographic print to sounds heard. Students were better able to segment a given word and write the sounds, then blend the word to check their spelling. The final chapter of this action research project demonstrates a complete examination of the data obtained in regards to existing research, connections to Common Core State Standards, a detailed explanation of the results, various strengths and
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limitations apparent within the study, and the researcher’s personal recommendations for future research.
CHAPTER FIVE: CONCLUSIONS

The research conducted during this eight-week study determined the effects of an intervention that focused on segmenting and blending phonemes to assist five first grade students who were performing below grade level with decoding expectations in the beginning of the year. Students were selected from the researcher’s classroom and were chosen due to low scores on assessments at the end of Kindergarten and reading below the district’s grade level expectations. Assessments used to consider participants for the study were the end of the year Fountas and Pinnell (2008) reading levels as well as Phonological Awareness Literacy Screening (PALS; Invernizzi, Juel, Swank, Meier, 2013) scores. The school district’s expectations using Fountas and Pinnell levels for students entering first grade is a level E. Students who were chosen to participate in the study entered first grade below level E. Data was collected throughout the eight weeks and suggested growth in the students’ ability to blend and segment phonemes, and increase their word recognition abilities through decoding. Student scores from the pretest were compared to posttest scores to determine progress. After data was analyzed, the researcher determined that the results of this study resembled the outcomes of existing research, which is detailed in the next section. Chapter Five will connect this study to existing research and the Common Core Standards, as well as include an explanation of the results. Strengths and limitations for the study will be discussed, in addition to recommendations for further study.

Connection to Existing Research

The results of this action research project resembled the outcomes of existing research that demonstrated that obtaining the decoding skills of segmenting and blending resulted in greater word recognition ability (National Reading Panel, 2000). This study also determined that
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Word recognition skills and strategies were essential in reading words accurately, especially when students were encountered with an unknown word. Furthermore, students who were not skilled in word recognition required an explicit intervention that focused on their specific word recognition needs. Through the use of an intervention, students were able to show progress in their ability to decode unknown words, and increase their phonological awareness skills.

Ryder, Tunmer, and Greaney (2007) confirmed that a phonemically based intervention was successful in improving the phonological awareness skills, decoding ability, and context-free word recognition skills of struggling readers. Similar to these, the results of this action research study suggested that the inclusion of phonemically based activities during the intervention improved students’ phonological awareness skills, specifically blending and segmenting phonemes, decoding abilities, and word recognition skills in identifying words out of context. Participants in this study used colored tiles to represent phonemes. They would segment the word and place a tile for each sound and then would blend the sounds to repeat the word. Through the intervention, progress was documented and aligned with existing research.

Similar to the study above, Pullen, Lane, Lloyd, Nowak, and Ryals (2005) confirmed that the decoding skill of blending would benefit beginning readers, especially when the use of manipulative letters was incorporated into an explicit intervention. Similar to these findings, the results of this study also demonstrated growth in the decoding of words due to the explicit intervention that used manipulative letters. Participants in this study used letter cards (see Appendix A) as manipulative letters and constructed dictated words given by the researcher. The students were instructed to blend the sounds together as they constructed the word, and then read the word quickly when they were done. This activity contributed to the students’ growth and aligned with the results of Pullen et al. (2005).
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Comparable to the other two studies, Allor, Gansle, and Denny (2006) confirmed that an intervention in phonemic awareness skills led to considerable growth in students’ ability to segment phonemes in spoken words which lead to faster responses to initial reading instruction. Results of this study were similar to this. Through the use of an intervention that incorporated phonemic awareness skills, students exhibited growth in their ability to segment phonemes in spoken words. Results of the Phoneme Segmentation Fluency assessment (Aimsweb, 2012) demonstrated considerable growth from pretest to posttest for each student. Unlike the results of Allor, Gansle, and Denny (2006), the researcher was not able to determine if the intervention impacted response times to initial reading instruction. The intervention was based on decoding skills that incorporated phonemic awareness skills, and did not examine the effects of reading instruction.

Daly, Chafouleas, Persampieri, Bonfiglio, and LaFleur (2004) also established that instruction in phoneme blending skills led students to develop proficiency in reading, especially when using decodable words. Similar to these, the results of this study also documented a growth in students’ ability to read decodable words. Students were instructed to blend the phonemes in decodable words while reading, writing, and making words. Four of the five students also became proficient in reading, and began to read appropriate grade level texts that were on level for this time of year. The researcher has noted an improvement in students’ ability to decode unknown words when encountered in text, and students have used this skill independently outside of the intervention.

Existing research along with this study have confirmed that the acquisition of phonemic awareness skills were essential in the accurate decoding of words, specifically segmenting and
blending the phonemes in words. Skilled readers who are effective in decoding words will be able to accurately read more words.

**Connection to the Common Core Standards**

The Common Core Standards that focused on phonics and word analysis skills to decode are supported by this research. According to the Common Core English Language Arts Standards for Foundational Skills in Reading, students in Kindergarten through fifth grade must know and apply grade level phonics and word analysis skills in decoding words (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). Furthermore, students in Kindergarten and first grade are expected to demonstrate an understanding of spoken words, syllables, and sounds as stated by the subsection of Phonological Awareness Standards under the Foundational Skills of Reading Standards. For example, in first grade students must know spelling-sound correspondences, distinguish sound differences for the same letter, orally produce words by blending sounds, isolate and pronounce all sounds, segment words into individual sounds, and decode regularly spelled words. As students progress through school, the phonics and word analysis skills for decoding words increases in difficulty to match grade level expectations. Throughout the intervention, there was an additional emphasis placed upon these standards to support the students outside of regular instruction. The researcher used modeling and explicit instruction in blending and segmenting phonemes to increase students’ understanding of phonics and decoding words.

**Explanation of Results**

The data that was collected for this action research project through the use of pretesting, progress monitoring, and posttesting demonstrated that the explicit intervention in blending and
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segmenting phonemes in words was successful in improving word recognition and overall reading performance for all students. The QRI-5 Word Lists (Leslie & Caldwell, 2011) and Fountas and Pinnell Word Lists (Fountas & Pinnell, 2008) results suggested that after a six week intervention, students increased their ability to recognize additional words. On the Pre-Primer 1 word list of the QRI-5, students increased the amount of words read by 41%. On the Beginning level of the Fountas and Pinnell word list, students increased by 17%. The results indicated growth in the students’ abilities to recognize more words. Words were presented in isolation throughout the intervention and were used out of context. Students needed to rely on their decoding strategies in order to read the word. This may have contributed to the amount of growth that was visible on both of the word list posttests as students were required to read in the same manner. Throughout the intervention, students used blending and segmenting strategies to decode unknown words. Before the intervention, students would say, “I don’t know” when they came across an unknown word on the list and moved on. After the intervention, all of the students attempted to decode all unknown words on the word lists. The intervention provided students with strategies to use when they approach an unknown word and the students began to demonstrate additional confidence when analyzing the word to decode it.

In addition, students also increased their ability to segment phonemes, an area of phonological awareness, as demonstrated by the results of the Phoneme Segmentation Fluency assessment (Aimsweb, 2012). Throughout the intervention students participated in Phoneme Grapheme Mapping (Grace, 2007) where they segmented phonemes using colored tiles. Students then mapped the written letter to the sound on graph paper where they could segment the sounds again. The segmenting of phonemes through the use of manipulatives assisted in the growth made by students on the Phoneme Segmentation Fluency posttest. Through this gain in
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phonological awareness, students were then able to decode more words through segmenting and blending as confirmed in the results of the Nonsense Word Fluency (Aimsweb, 2012) assessment and the Road to Reading Levels Assessment (Blachman & Tangel, 2008). Students demonstrated growth on the Nonsense Word Fluency assessment with identifying more non-real words by the word’s individual sounds or by reading the entire word correctly. Students also identified more decodable words on the Road to Reading assessment and were able to move to the third level, with a new vowel pattern that was unknown to students. Both assessments include decodable words. The increase in scores from the pretest to posttest was contributed by the amount of decodable words that were used in the intervention. Students segmented and blended the sounds in decodable words, read decodable books and word cards, and wrote lists and sentences that used decodable words. Through explicit instruction in short vowel patterns with digraphs, students were able to segment and blend sounds in order to identify the same patterns during posttest data collection.

Further, the Words Their Way Spelling Inventory (Helman, Bear, Templeton, Invernizzi, & Johnson, 2012) results also suggested an improvement in matching orthographic print to sounds. Students were able to segment a given word and write the sounds, then blend the word to check their spelling. The gains made by students as demonstrated on the posttest, suggest that the intervention was successful in improving spelling abilities. Throughout the intervention, students segmented and wrote words through Phoneme Grapheme Mapping (Grace, 2007) as well as wrote lists and sentences that contained decodable words. Outside of the intervention, the students continued to stretch words out as they wrote in an authentic context and included the short vowel and digraph sounds that were explicitly taught in the intervention. Not only did
students retain the knowledge of mapping a letter to a sound as seen on the posttest, but they also applied the new knowledge to other areas of their learning.

**Strengths**

Several strengths of the study contributed to the growth made by students. One strength was that the study used a predictable weekly format that aligned with set lesson plans for each day of the week. Students understood the blending and segmenting activities they were directed to complete, and only needed to identify the new sounds that were studied. Every Monday and Wednesday followed the same set plan, every Tuesday and Thursday had the same activities, and every Friday remained the same throughout the study. Activities were varied between the three days of the week, and did not follow a structured format of the same process each day. Students were more engaged in the intervention, and did not become tired of the same sequence of events each intervention time.

An additional factor to the success of the intervention was the activities that were chosen for students to complete during the intervention. Activities included reading letter flashcards, making words with letter cards, using tiles to map sounds to print, reading decodable word cards, reading decodable books, writing dictated lists of words and sentences in a journal, and completing word sorts (see Appendix A). Students were comfortable with the activities as they followed a set schedule depending on the day of the week. To begin, only one vowel sound was introduced in instruction. This allowed students to understand the routine of the activities and experience success within the first week. More vowel sounds and digraphs were then added each week to make instruction more complex. The activities were also interactive with a fast pace to
keep students motivated and interested in reading. When one activity was completed, another one quickly began.

Another contributing factor to the success of the intervention was that the intervention was designed with the students’ needs as the focus. Pretest data analysis determined the phonic elements that students needed in order to assist with their decoding abilities. Sounds that students were using but confusing (short vowels and digraphs) were placed into the intervention plan and explicitly taught throughout the intervention. The growth from pretest to posttest supports this strength of the study.

Furthermore, an additional factor that contributed to the success of the intervention was that a small group of students were selected to participate instead of an entire class. Students received more support from the researcher and received explicit instruction, with modeling, and corrective feedback during the intervention instruction time. Students’ progress was monitored more closely due to only five students who participated. The small group setting also allowed students to be comfortable with the researcher and their peers and created an atmosphere where mistakes were accepted.

Limitations

With the study’s strengths in mind, limitations must also be examined. The short six week timeframe of the intervention yielded significant differences in pretest to posttest scores, but yet was not the only intervention the students will need to be successful in first grade. A similar small group instruction model will continue with the students of this study, but will include new patterns that match classroom instruction, for example, the VCe pattern. A longer
Another limitation to the study was that the intervention group was not able to read authentic texts as a group. The intervention only included decodable books that reinforced the phonic patterns that were studied to increase blending and segmenting words. Students had experience with authentic texts outside of the intervention, but were not able to apply word recognition abilities to those books in small group. While decodable books assisted the students in practicing their decoding skills, these are not the type of books students will encounter in their everyday life.

**Recommendations for Further Study**

Based on the results that were obtained as well as some of the strengths and limitations of this research, there are several recommendations the researcher would make to enhance the intervention. One recommendation to consider for future research would be to include the same sequence of events each day instead of varied activities throughout the week. Would the study be more beneficial and produce greater results if fewer activities were used during the week and the same activities were used each day? While this study produced significant results, the researcher wonders if the results could have been more substantial if the intervention included the same format each day of the week. After the examination of twelve studies, a majority of the studies included interventions that followed the same format each day. The studies also produced higher results on the posttest as this study did, but is something to consider by future researchers.

Another recommendation for future researchers would be to extend the intervention and create a longer timeframe for the study. While students became secure in short vowels and
digraphs, they will need continued support in other phonic patterns. At this particular grade level, an intervention that included VCe patterns would be beneficial to students as this is a common pattern students are exposed to in writing and reading texts at a first grade level. The intervention was successful in this short timeframe, but students may produce greater results from a longer intervention.

A final recommendation for future studies would be to consider adding more students into the intervention, or including an entire class. When examining the growth between pretest and posttest scores, would more students mean the same results for all of those students? If the five students were successful in increasing their word recognition abilities and can decode more words, this instruction may be beneficial to all students in a first grade classroom especially when Common Core Standards are examined.

**Conclusion**

This current action research study suggested that an explicit intervention in blending and segmenting phonemes with a small group of first grade students improved their word recognition abilities through the use of decoding. The results of this study resembled the outcomes of existing research. Existing research that was examined prior to the start of the intervention established that obtaining the decoding skills of segmenting and blending resulted in greater word recognition ability. The current study also aligned with Common Core State Standards as first grade students must know and apply grade level phonics and word analysis skills when decoding words. Students were also required to demonstrate an understanding of spoken words, syllables, and sounds as part of the Phonological Awareness subsection of the Common Core State Standards. The effectiveness of this intervention was measured through six informal
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assessments. Based on data analysis, this intervention was considered to be effective at improving students’ word recognition abilities through the use of decoding. The results of the informal posttest assessments demonstrate growth by all students on all of the assessments.

While this study produced numerous strengths, there were also limitations to be considered by future researchers. Through the investigation of how such modifications could potentially affect student outcomes, future research can continue to refine and improve upon the word recognition intervention presented here.
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Appendix A

Intervention Materials

Figure 1. Flashcards

Figure 2. Phoneme grapheme mapping
Figure 3. Decodable word cards

Figure 4. Letter cards for making words
Figure 5. Examples of decodable books that were used

Figure 6. Journal entry of dictated word lists and sentence
## Appendix B

QRI-5 Examiner Word Lists

![Word Lists Table](image)

**Pre-Primer 1**

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**Total Correct Identified** $\frac{17}{17} = \%$

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**Total Number Correct** $\frac{20}{20} = \%$

**Levels**

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**Figure 1.** Pre-primer 1 and pre-primer 2/3 word lists
### Figure 2. Primer and first grade word lists

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<td>8. run</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>9. want</td>
<td>—-</td>
<td>—-</td>
<td>9. enough</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>10. animals</td>
<td>—-</td>
<td>—-</td>
<td>10. brain</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>11. sing</td>
<td>—-</td>
<td>—-</td>
<td>11. air</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>12. went</td>
<td>—-</td>
<td>—-</td>
<td>12. knew</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>13. jump</td>
<td>—-</td>
<td>—-</td>
<td>13. put</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>14. read</td>
<td>—-</td>
<td>—-</td>
<td>14. heard</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>15. said</td>
<td>—-</td>
<td>—-</td>
<td>15. afraid</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>16. live</td>
<td>—-</td>
<td>—-</td>
<td>16. wind</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>17. there</td>
<td>—-</td>
<td>—-</td>
<td>17. choose</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>18. one</td>
<td>—-</td>
<td>—-</td>
<td>18. without</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>19. great</td>
<td>—-</td>
<td>—-</td>
<td>19. move</td>
<td>—-</td>
<td>—-</td>
</tr>
<tr>
<td>20. every</td>
<td>—-</td>
<td>—-</td>
<td>20. then</td>
<td>—-</td>
<td>—-</td>
</tr>
</tbody>
</table>

**Total Correct Automatic** /20 = ____%
**Total Correct Identified** /20 = ____%
**Total Number Correct** /20 = ____%
Appendix C

Fountas and Pinnell Where-to-Start Word Test- Individual Records

### Figure 1. Beginning, level 1, and level 2 word lists

<table>
<thead>
<tr>
<th>Beginning</th>
<th>Level 1</th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>me</td>
<td>jump</td>
<td>want</td>
</tr>
<tr>
<td>I</td>
<td>here</td>
<td>friend</td>
</tr>
<tr>
<td>can</td>
<td>little</td>
<td>puppy</td>
</tr>
<tr>
<td>to</td>
<td>went</td>
<td>basket</td>
</tr>
<tr>
<td>my</td>
<td>has</td>
<td>could</td>
</tr>
<tr>
<td>we</td>
<td>girl</td>
<td>dark</td>
</tr>
<tr>
<td>in</td>
<td>will</td>
<td>down</td>
</tr>
<tr>
<td>like</td>
<td>have</td>
<td>road</td>
</tr>
<tr>
<td>it</td>
<td>ball</td>
<td>plant</td>
</tr>
<tr>
<td>up</td>
<td>make</td>
<td>away</td>
</tr>
<tr>
<td>mom</td>
<td>play</td>
<td>morning</td>
</tr>
<tr>
<td>the</td>
<td>was</td>
<td>three</td>
</tr>
<tr>
<td>and</td>
<td>bike</td>
<td>cool</td>
</tr>
<tr>
<td>he</td>
<td>with</td>
<td>drop</td>
</tr>
<tr>
<td>look</td>
<td>they</td>
<td>grass</td>
</tr>
<tr>
<td>is</td>
<td>this</td>
<td>when</td>
</tr>
<tr>
<td>see</td>
<td>bed</td>
<td>first</td>
</tr>
<tr>
<td>come</td>
<td>feet</td>
<td>train</td>
</tr>
<tr>
<td>get</td>
<td>one</td>
<td>queen</td>
</tr>
<tr>
<td>at</td>
<td>said</td>
<td>scream</td>
</tr>
</tbody>
</table>

get

- /20
- /20
- /20
## Figure 2. Level 3 and level 4 word lists

<table>
<thead>
<tr>
<th>Level 3</th>
<th>Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>plate</td>
<td>silence</td>
</tr>
<tr>
<td>year</td>
<td>serious</td>
</tr>
<tr>
<td>noise</td>
<td>nature</td>
</tr>
<tr>
<td>under</td>
<td>station</td>
</tr>
<tr>
<td>twisted</td>
<td>graceful</td>
</tr>
<tr>
<td>giant</td>
<td>heavy</td>
</tr>
<tr>
<td>knives</td>
<td>against</td>
</tr>
<tr>
<td>what</td>
<td>excuse</td>
</tr>
<tr>
<td>around</td>
<td>traffic</td>
</tr>
<tr>
<td>because</td>
<td>reward</td>
</tr>
<tr>
<td>forest</td>
<td>plastic</td>
</tr>
<tr>
<td>once</td>
<td>ocean</td>
</tr>
<tr>
<td>scramble</td>
<td>perform</td>
</tr>
<tr>
<td>again</td>
<td>delicious</td>
</tr>
<tr>
<td>careful</td>
<td>pebble</td>
</tr>
<tr>
<td>breakfast</td>
<td>understood</td>
</tr>
<tr>
<td>better</td>
<td>destiny</td>
</tr>
<tr>
<td>suddenly</td>
<td>future</td>
</tr>
<tr>
<td>badge</td>
<td>anger</td>
</tr>
<tr>
<td>village</td>
<td>honey</td>
</tr>
</tbody>
</table>

/20
/20
### Appendix D

Aimsweb Nonsense Word Fluency- Progress Monitor Assessment Probe

![Aimsweb Nonsense Word Fluency Probe Number 11](image)

*Figure 1. Aimsweb nonsense word fluency probe number 11*
### Aimsweb Phoneme Segmentation Fluency- Progress Monitor Assessment Probe

**Figure 1.** Aimsweb phoneme segmentation fluency probe number 4
Figure 1. Red, orange, and yellow levels
## Levels Assessment Recording Form (continued)

### Green Level: Group I Vowel Teams (Including Digraphs and Blends)

<table>
<thead>
<tr>
<th>feed</th>
<th>toe</th>
<th>now</th>
<th>road</th>
<th>play</th>
</tr>
</thead>
<tbody>
<tr>
<td>chain</td>
<td>beat</td>
<td>easy</td>
<td>sheep</td>
<td>float</td>
</tr>
<tr>
<td>rain</td>
<td>clean</td>
<td>row</td>
<td>pie</td>
<td>stay</td>
</tr>
<tr>
<td>creep</td>
<td>team</td>
<td>stain</td>
<td>show</td>
<td>cheek</td>
</tr>
</tbody>
</table>

Students: ____________
Date: ____________

---

### Green Level: Group II Vowel Teams (Including Digraphs and Blends)

<table>
<thead>
<tr>
<th>flew</th>
<th>out</th>
<th>coin</th>
<th>toy</th>
<th>draw</th>
</tr>
</thead>
<tbody>
<tr>
<td>haul</td>
<td>chow</td>
<td>broom</td>
<td>shook</td>
<td>bread</td>
</tr>
<tr>
<td>spread</td>
<td>zoo</td>
<td>join</td>
<td>lawn</td>
<td>foot</td>
</tr>
<tr>
<td>couch</td>
<td>broil</td>
<td>few</td>
<td>mouth</td>
<td>town</td>
</tr>
</tbody>
</table>

Students: ____________
Date: ____________

---

### Blue Level: Vowel + r Syllables (Including Digraphs and Blends)

<table>
<thead>
<tr>
<th>far</th>
<th>air</th>
<th>corn</th>
<th>turn</th>
<th>her</th>
</tr>
</thead>
<tbody>
<tr>
<td>scar</td>
<td>dirt</td>
<td>fork</td>
<td>hurt</td>
<td>perk</td>
</tr>
<tr>
<td>bark</td>
<td>firm</td>
<td>storm</td>
<td>fur</td>
<td>clerk</td>
</tr>
<tr>
<td>chart</td>
<td>twirl</td>
<td>short</td>
<td>curb</td>
<td>stern</td>
</tr>
</tbody>
</table>

Students: ____________
Date: ____________

---

### Purple Level: Consonant + le Words (Including Digraphs and Blends)

<table>
<thead>
<tr>
<th>little</th>
<th>bubble</th>
<th>puzzle</th>
<th>apple</th>
<th>needle</th>
</tr>
</thead>
<tbody>
<tr>
<td>bugle</td>
<td>eagle</td>
<td>sparkle</td>
<td>turtle</td>
<td>handle</td>
</tr>
<tr>
<td>table</td>
<td>sniffle</td>
<td>nibble</td>
<td>staple</td>
<td>shingle</td>
</tr>
<tr>
<td>juggle</td>
<td>thimble</td>
<td>cradle</td>
<td>simple</td>
<td>handle</td>
</tr>
</tbody>
</table>

Students: ____________
Date: ____________

---

---
### Figure 1. Feature guide for primary spelling inventory

- **Spelling Stages**:
  - EARLY
  - MIDLE
  - LATE

- **Features**:
  - e, a, o

- **Words Spelled Correctly**
  - Total: 28

- **Teacher**

- **Students Name**

- **Date**

<table>
<thead>
<tr>
<th>Feature</th>
<th>1. fan</th>
<th>2. pat</th>
<th>3. dog</th>
<th>4. rob</th>
<th>5. hop</th>
<th>6. wall</th>
<th>7. gun</th>
<th>8. slid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>f</td>
<td>p</td>
<td>d</td>
<td>r</td>
<td>h</td>
<td>w</td>
<td>g</td>
<td>s</td>
</tr>
<tr>
<td>Final</td>
<td>n</td>
<td>t</td>
<td>g</td>
<td>b</td>
<td>p</td>
<td>l</td>
<td>m</td>
<td>l</td>
</tr>
</tbody>
</table>

- **Corresponding Diagraphs**

- **Blends**

- **Syllables and Affixes**

- **Future Points**

- **Inflected Endings**

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