THE EFFICACY OF SYSTEMATIC, EXPLICIT LITERACY INSTRUCTION IN KINDERGARTEN AND FIRST GRADE

A Dissertation

by

EMILY OCKER DEAN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2007

Major Subject: Curriculum and Instruction

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Approved by:

Chair of Committee,	R. Malatesha Joshi
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ABSTRACT

The Efficacy of Systematic, Explicit Literacy Instruction in

Kindergarten and First Grade. (May 2007)

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This investigation examined the extent to which teacher implemented systematic, explicit instruction affected the literacy achievement of kindergarten and first grade students. Two cohorts of students in a southwestern United States school district were utilized for this study. Cohort 1 (n=94) received classroom literacy instruction from the state adopted basal reading series. Cohort 2 (n=96) received literacy instruction from the basal series and an additional reading program designed to systematically and explicitly teach phonological awareness, letter name identification, and the alphabetic principle. Each cohort was followed from the middle of kindergarten through the end of first grade. Kindergarten measures included the Texas Primary Reading Inventory (TPRI) tests of phonological awareness, letter naming, letter sound knowledge, and listening comprehension, and were administered at the middle and end of kindergarten. At the beginning of first grade, TPRI phonological awareness, word reading, reading comprehension, and fluency were measured. Middle of year first grade variables were TPRI reading comprehension and fluency. End of the year first grade measures were

TPRI word reading, fluency, reading comprehension, and Iowa Test of Basic Skills (ITBS) word analysis, reading comprehension, listening comprehension, vocabulary, and spelling. A MANCOVA was conducted at each interval using English language learner status as the covariate. Hierarchical regression analysis was conducted to determine which variables best predicted end of first grade reading comprehension, word reading, and fluency. Results from the MANCOVA indicated that Cohort 2 outperformed Cohort 1 on kindergarten TPRI measures of phonological awareness, letter naming, and letter sound correspondences. Cohort 2 also performed better than Cohort 1 on first grade TPRI reading comprehension, fluency, and end of year word reading, however, there were no statistically significant differences on the ITBS measures. Conclusions and recommendations for further research and for practice are also discussed.

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INTRODUCTION

According to the National Center for Educational Statistics (2005), student performance on the National Assessment of Educational Progress showed that more than one-third of fourth graders read below basic levels. Even more shocking is the 20 percent of American school age children who will have severe difficulty with reading before third grade (National Institute of Child Health and Human Development, NICHD, 2000). But what is the underlying cause of this poor performance? Adams (1990) explained although some students enter school with many literacy experiences and large amounts of exposure to print, many other students enter school with limited exposure to printed materials and few literacy experiences. In what Stanovich (1986) termed the 'Matthew effect', many of these students with few literacy experiences begin school poorly equipped to read and are likely to become and remain poor readers throughout their lives.

In order to combat students' limited literacy experiences, it is important that early elementary teachers provide quality reading instruction upon school entry. Unfortunately, it has been repeatedly shown that school children fail at learning to read because of ineffective classroom instruction (Calfee, 1983; Carroll, 1963). Reading failure due to poor instruction is especially prominent in the early grades (Juel, 1988). The National Research Council (Snow, Burns, & Griffin, 1998) determined "quality classroom instruction in kindergarten and the primary grades is the single best weapon

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This dissertation follows the format of *Reading Research Quarterly*.

against reading failure" (p. 343); therefore, it is important to examine what skills quality classroom instruction should teach in the early grades.

Prerequisite Skills for Reading Acquisition

In recent decades, a substantial amount of research has focused on determining the necessary foundational skills for reading acquisition. Much of this research provided evidence that these skills must include an awareness and understanding of the sounds of language and how these sounds correspond to the written representations of language. The most commonly cited early literacy skills include phonological and phonemic awareness, understanding of the alphabetic principle, knowledge of letters, and letter naming speed and accuracy (NICHD, 2000; Snow, Burns, & Griffin, 1998). It has been determined that each of these skills is necessary for becoming a successful reader.

Phonological and phonemic awareness

There is a growing amount of evidence from correlational and experimental studies that phonological awareness and, more specifically, phonemic awareness are important foundational skills for reading acquisition. Phonological awareness is the ability to attend to, reflect on, and manipulate the sounds of spoken language (Castles & Coltheart, 2004; Goswami, 2002; Liberman, Shankweiler, Fisher, & Carter, 1974). Phonological awareness is an umbrella term that includes spoken language skills such as noticing similarities between sounds in words, identifying rhyme or alliteration, and segmenting words into syllables (Snow, Burns, & Griffin, 1998). Phonemic awareness is the highest level of phonological awareness. It is the awareness that spoken language is made up of individual sounds (called phonemes). Children who are phonemically aware

are able to segment spoken words into their constituent sounds, blend phonemes into spoken words, and change or delete sounds within words. Research has repeatedly shown that phonological awareness, especially at the phoneme level, is a strong predictor of reading achievement (Adams, 1990; Blachman, 1991; Bradley & Bryant, 1983, 1985; Ehri, 1991; Juel, 1988; Lundberg, Olofsson, & Wall, 1980; Stanovich, 1992; Stanovich, Feeman, & Cunningham, 1983; Torgesen, Wagner, & Rashotte, 1994; Wagner, Torgesen, & Rashotte, 1994).

Unfortunately, some students enter school with limited phonological abilities and many students may have specific difficulty with phonemic awareness. However, evidence supports training in phonological awareness, with specific attention to phonemic awareness, in the early grades as a foundational skill for reading. Training studies have indicated that phonological awareness can be taught (Byrne & Fielding-Barnsley, 1993; Content, Kolinsky, Morais, & Bertelson, 1986; Olofsson & Lundberg, 1983; Rosner, 1974) and has an effect on students' reading achievement (Brennan & Ireson, 1997; Lundberg, Frost, Petersen, 1988; Olofsson & Lundberg, 1985; Schneider, Kuspert, Roth, & Vise, 1997; Stanovich, 1992). Additionally, two recent meta-analyses (Bus, & van IJzendoorn, 1999; Ehri, Nunes, Willows, Schuster, Yaghoub-Zadeh, & Shanahan, 2001) concluded that explicit training in phonological awareness has a significant impact on reading skills, revealing medium to strong combined effect sizes. However, although the converging evidence points to phonological and phonemic awareness as an important skill in reading acquisition, the ability to manipulate the

segments of spoken language is not sufficient for learning to read (Adams, 1990; Stanovich, 1986), students must be able to link spoken language with written language.

The National Reading Panel (NICHD, 2000) reported that explicit instruction in phonological awareness produces significant benefits when simultaneously and systematically taught with letters. Research provides evidence that instruction in phonological awareness is especially beneficial when taught with letters (Ball & Blachman, 1991; Bradley & Bryant, 1983). Additionally, training in phonological awareness is highly productive when taught in conjunction with letter-sound correspondences (Cunningham, 1990; Fox & Routh, 1984; Vellutino & Scanlon, 1987).

Alphabetic principle

Skilled readers are able to quickly and accurately connect their knowledge of phonemes to the written representations of language (graphemes). Learning to use the alphabetic principle, the understanding that there is a relationship between spoken and written language, helps children become skilled readers. Instruction in the alphabetic principle, also known as phonics, involves learning the letter-sound correspondences and spelling patterns and applying this knowledge to translating written language into spoken words (known as decoding). This instruction can be even more effective when provided in a structured, systematic way. Phonics instruction is considered systematic when all the letter-sound correspondences are taught in a clearly defined sequence (Ehri, 2004). Knowing how to apply the alphabetic principle (or phonics), while reading, significantly contributes to children's ability to read words in isolation and in text.

Research supports the systematic, explicit instruction of the alphabetic principle as a valuable part of learning to read (Adams, 1990; Chall, 1967; Foorman, Chen, Carlson, Moats, Francis, & Fletcher, 2003; Snow, Burns, & Griffin, 1998). The evidence suggests that children who receive systematic phonics instruction exhibit better scores on tests of word reading and spelling than those who do not receive it (Armbruster, Lehr, & Osborn, 2001; Blachman, Tangel, Ball, Black, & McGraw, 1999; Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Stuart, 1999; Torgesen, et al., 1999; Vandervelden & Siegel; 1997). The National Reading Panel (2000) also concluded that reading and spelling are greatly enhanced by systematic phonics instruction especially when included in early reading instruction, i.e. kindergarten and first grade. In a recent review of the NRP's meta-analysis, Ehri (2004) found that the effect of phonics instruction on reading acquisition were statistically larger for kindergarten and first grade than for second through sixth grades, producing moderate to strong effect sizes in five out of six literacy outcomes, indicating that phonics instruction is most beneficial in the early grades. Additionally, the review concluded that "systematic phonics instruction helps children learn to read more effectively than nonsystematic phonics or no phonics instruction" (Ehri, 2004, p. 178).

Letter knowledge and letter naming

Knowledge of letters and the ability to name them is a valuable skill in learning to read. In past decades, there has been a convergence of evidence that, in addition to phonological awareness, letter name knowledge is one of the most predictive variables in reading acquisition (Bishop, 2003; Share, Jorm, Maclean, & Matthews, 1984). It has

been repeatedly shown that children who have difficulty learning letter names are likely to have difficulty learning to read (Badian, 1994, 1995; Bond & Dykstra, 1967; Chall, 1967/1983). Additionally, letter name knowledge may help students remember letter sound associations (McBride-Chang, 1999). In her 1983 review of letter naming studies, Ehri suggested that letter name knowledge and letter sound knowledge may be inseparable.

The rapid naming of letters has also been shown to predict later reading achievement. Rapid naming of letters is measured by tasks that require students to name five randomly repeated letters as rapidly as possible (Allen & Beckwith, 1999). It has been shown that the speed with which children name letters was especially predictive of word recognition skills (Blachman, 1984; Wolf, Bally, & Morris, 1986; Wolf & Obregon, 1992). Walsh, Price, and Gillingham (1988) found that letter naming speed is positively correlated with later reading acquisition in kindergarteners. Additionally, it has been found that for students with reading difficulties, letter naming speed significantly predicted word identification and passage comprehension (Cornwall, 1992).

Statement of the Problem

One of the most convincing findings of recent reading research was that students who are poor readers in the early grades remain poor readers throughout their educational careers. Lyon (1995) found that 74% of poor readers in third grade were still poor readers in ninth grade. In studies involving first graders, researchers found that students who were poor readers almost always remained poor readers (Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Torgesen & Burgess, 1998). Juel

(1988) found that poor readers in the first grade had only probability of .13 of catching up with their peers by fourth grade. By providing systematic, explicit literacy instruction in kindergarten and first grade, teachers provide a preventative measure to combat the growing incidence of reading failure in our schools. When intensive, systematic, and explicit reading instruction is implemented in the early grades, children at risk for reading failure have shown significant improvement (Schenck, Fitzsimmons, Bullard, Taylor, & Satz, 1980). This was especially true when the reading instruction includes both phonics instruction and phonemic awareness. It has been shown that systematic phonics instruction and training in phonemic awareness is especially important in kindergarten (Foorman, Francis, Shaywitz, Shaywitz, & Fletcher, 1997; Wagner, Torgesen, & Rashotte, 1994). Systematic phonics instruction is important at the early grades because it results in better decoding abilities than other instructional methods (NICHD, 2000; Torgesen, Wagner, & Rashotte, 1997). Additionally, training kindergarten students in phonemic awareness had a predictive relationship with reading (NICHD, 2000) and lead to improvement in reading and spelling (Ball & Blachman, 1991; Cunningham, 1990; McCutchen et al., 2002; Tangel & Blachman, 1992).

Significance of the Study

Most experimental findings on explicit, systematic reading instruction come from training studies. However, the majority of the training studies are not conducted by the classroom teacher but are researcher implemented, conducted by the researcher in or out of the classroom either individually or in small groups. Fuchs et al. (2001) examined how many qualitative and quantitative scholarly, peer reviewed training studies have

been implemented by the classroom teacher. The studies they examined implemented training in phonological awareness, decoding, or both and were conducted in preschool or kindergarten. Fuchs and his colleagues found 13 training studies in preschool or kindergarten that used the classroom teacher as program implementer. Of the 13 studies, nine were conducted in kindergarten with six of the nine conducted in countries other than United States, which results in less than 4 studies that were conducted in English speaking kindergarten classrooms. The present study examined a teacher implemented systematic explicit program for teaching literacy skills to kindergarten and first grade students in English-speaking classrooms.

Additionally, in recent years the effectiveness of professional development for teachers has been strongly criticized. Most of the empirical evidence supports this criticism, indicating that formal professional development is typically short term and lacking in continuity and follow-up (Fullan & Stiegelbauer, 1991; Lewis, Parsad, Carey, Bartfai, Farris, & Smerdon, 1999; Mullens, Leighton, Laguarda, & O'Brien, 1996). The instruction examined in this study occurred as a result of professional development training conducted through Neuhaus Education Center. Neuhaus Education Center is a non-profit organization in Houston, Texas that focuses on teacher training in research based reading, writing, and spelling instruction. They also provide parent consultation and adult literacy services. During the 2003-2004 school year, Neuhaus Education Center trained over 4000 teachers throughout the state of Texas. Over the last 24 years, the center has provided professional development to more than 31,000 teachers (For further information, see www.neuhaus.org).

Purpose of the Study

The present study examined the effects of teacher implemented systematic explicit instruction in phonological awareness, letter naming, and alphabetic principle on kindergarten and first grade students' literacy achievement. It is hypothesized the students that received systematic, explicit instruction in phonological awareness, alphabet naming, and letter-sound correspondences will achieve equally as well or better than those who received regular classroom instruction. It is also hypothesized that students who received this curriculum will name more letters, identify more letter-sound correspondences, and read more words at end of year 1 and year 2 than the comparison group of similar children.

Research Questions

The present study addressed the following research questions:

1. Is there a statistically significant difference in the literacy achievement at the end of kindergarten for students who received systematic, explicit instruction than those who do not?
2. If there is a statistically significant difference between the groups at the end of kindergarten, does the difference between the groups become greater with further systematic instruction in first grade?
3. How are these students different at the end of year kindergarten and first grade in terms of:
    a. Phonological Awareness
    b. Word reading

c. Letter knowledge

d. Letter-sound correspondence

e. Listening comprehension

f. Reading comprehension

g. Fluency

Due to the obvious connections among the dependent variables and the exploratory nature of the current study, these questions will be best served to be answered in how each of the dependent variables of interest relate to each other and how they interact together to disseminate groups that are statistically and practically different from each other.

Limitations

It is likely that there may be several limitations of this study. A possible limitation is that the sample is not randomly selected. The sample used in the present study is a sample of convenience and therefore, may not be generalizeable to other groups. Another possible limitation of this study is that the content and quality of early reading instruction will vary due to differences in teacher effectiveness and instructional method in both the treatment and comparison groups. Additionally, teacher "buy in" to the instructional program for the treatment group may also create a limitation. A limitation may arise due to variance in teachers' levels of experience. Finally, because this study uses measures already used by the school to assess literacy achievement, limitations may arise regarding the generalizability of the findings.

Organization of the Remainder of the Study

Chapter II will present a comprehensive review of the literature including findings on the effects of phonological awareness training, systematic phonics instruction, and letter naming and accuracy on literacy acquisition. Chapter III will present the methodology and data analysis used in the study. Chapter IV will report the findings of the data analysis. The final chapter will discuss the findings of the study as well as possible implications for further research.

CHAPTER II

REVIEW OF THE LITERATURE

Learning to read is the single most important educational goal for all children albeit the most difficult as well. Children who become successful readers are more likely to be successful in school (Adams, 1990). However, those who fail to successfully learn to read in the early grades are unlikely to catch up with their peers. The current chapter presents a review of the stages of reading development, the development of word reading abilities, and the literature on the prerequisite skills necessary for reading acquisition. Specifically, it extends the discussion on the findings on phonological and phonemic awareness, training studies in phonological awareness, training studies that integrate phonological awareness and the alphabetic principle, approaches to phonics instruction, and the effects of letter naming on reading acquisition.

Stages of Reading Development

Jeanne Chall's *Stages of Reading Development* (1996) clearly outlined six stages in which reading develops over time. The first three stages are often referred to as the 'learning to read' stages and the final three stages are considered the 'reading to learn' stages. Because this study was primarily concerned with how students learn to read in kindergarten and first grade, a discussion of the 'learning to read' stages will follow.

Children in stage 0, the prereading stage, range in age from birth to 6 years. These readers are characterized by their increasing understanding of the language and the world around them. When reading, they rely heavily on contextual knowledge and logographic information to 'guess' at words. Readers in the prereading stage begin to

use phonetic cues and begin to recognize rhyme and alliteration. During the prereading stage, children should participate in many opportunities to play with language, engage in pseudoreading, and make connections between their knowledge of the language and the written text.

Stage 1 is the initial reading or decoding stage. Readers enter this stage around 6 years of age or entrance into first grade. Development in this stage may last through the middle of second grade. In the initial reading or decoding stage, children begin to rely heavily on the text. These readers spend time ‘sounding out’ words and attempting to use phonetic cues to decode words. Readers in stage 1 begin to understand the relationship between letters and the sounds of language. Direct systematic instruction in letter-sound associations and blending is appropriate for this stage.

In stage 2, readers become successful at decoding. Around 7 years old, they begin to become automatic at decoding which frees them to focus on comprehension. Readers develop automaticity in recognizing orthographic patterns, which results in fluent reading. Readers in this stage should be encouraged to engage in recreational reading, repeated readings of familiar texts, and provided with opportunities to practice fluent reading.

Development of Word Reading Ability

It has been repeatedly suggested that word recognition develops through a series of phases (Ehri, 1995, 1998; Frith, 1985; Gough, Juel, & Griffith, 1992). Young readers begin to read using visual cues or symbols to recognize words (Frith calls this stage “logographic”). These cues may be very simplistic, the shape and color of a stop sign

may trigger the recognition of the word ‘stop’, or more sophisticated cues, “such as the two eyes in the middle of *look*” (Ehri, 1994, p. 325). These visual cues provide meaning bearing access to recognizing the printed word. As readers develop awareness of the sounds in language (called phonological awareness), they begin to apply their knowledge of sound when reading words. Ehri calls this second stage “phonetic cue reading”. Students in this stage have partially developed understanding of the relationship between phonemes and letters. They combine their knowledge of sounds and recognition of initial letters to cue word reading. Once full understanding of letter-sound correspondences has developed, readers begin to use all the letters and sounds in the word. This stage of full alphabetic coding must be reached in order for a reader’s word recognition skills to be efficient, although it is not yet fluent. Fluent, automatic word recognition is reached in the final stage (called consolidated word recognition by Ehri, orthographic stage by Frith, and cipher reading by Gough et al.). Instant word recognition of unfamiliar word is possible through the reader’s understanding of the consistent spelling patterns. In order for readers to progress through these phases of word recognition, they must receive quality literacy instruction in phonological awareness, the alphabetic principle, and letter naming.

Phonological and Phonemic Awareness

Of the reading research conducted over the last 30 years, one of the most convincing findings is the role of phonological awareness in learning to read. Phonological awareness is an important aspect in reading and writing, which involves the oral manipulation of the sounds in words. It is the “explicit awareness of the sound

structure of words" (Moats, 1994, p. 83). Phonological awareness activities fall on a continuum of difficulty beginning with rhyme and alliteration, then sentence segmentation, syllable segmentation and blending, onset-rime segmentation and blending, and finally the most difficult level, phonemic awareness. Phonemic awareness refers to the ability to manipulate phonemes in spoken words. A phoneme is "the smallest unit constituting spoken language" (NICHD, 2000, p. 2-1). Phonemes make up the individual, separable speech sounds in a word. Phonemic awareness activities include isolation of phonemes, segmentation of phonemes, blending of phonemes, and deletion of phonemes (NICHD, 2000). It has been found that phonological awareness ability, especially at the phoneme level, is highly predictive of future reading and spelling achievement (Adams, 1990; Bradley & Bryant, 1983; 1985; Liberman, & Liberman, 1990; Mann, 1993).

In one of the first studies on phonological awareness, Liberman, Shankweiler, Fischer, and Carter (1974) investigated the relationship of phonological segmentation tasks to reading acquisition. One hundred thirty-five students from preschool (n=46), kindergarten (n=49), and first grade (n=40) were randomly assigned to one of two treatment groups, phoneme segmentation or syllable segmentation. A measure of intelligence found no statistically significant difference between the groups. Each group participated in a segmenting activity in which they tapped the number of segments (phonemes or syllables) in 42 spoken words. The groups were then compared on two performance measures: trials to criterion, which consisted of the number of trials need by each child to perform six consecutive trials without examiner demonstration, and

mean errors to pass or fail six consecutive trials. The trials to criterion results indicated that phoneme segmentation was more difficult than syllable segmentation. Ability to segment phonemes increased with grade level, finding that none of the preschool children, only 17% of kindergarteners, and 70% of first graders successfully segmented phonemes. Additionally, it was shown that errors in both syllable and phoneme segmenting decreased with grade level, however, phoneme segmentation remained more difficult than syllable segmentation. Liberman et al. concluded that phoneme segmentation is more difficult than syllable segmentation and develops later in young children. They also indicated that students may benefit from instruction in segmenting phonemes and syllables during the first years of school. Finally, the authors noted that deficits in phoneme segmentation may lead to deficiencies in reading and spelling in later grades.

Share, Jorm, Maclean, and Matthews (1984) studied kindergarteners at school entry using measures of phonemic segmentation, letter name knowledge, memory for sentences, and many others such as father's occupation and television watching. Of the many variables they examined, Share et al. determined that at the end of kindergarten and first grade, phonemic awareness, along with letter name knowledge, was the best predictor of reading ability. Phonemic awareness was highly correlated with kindergarten reading achievement and first grade reading achievement, at 0.66 and 0.62 respectively.

In part 1 of their report, the NRP (NICHD, 2000) used meta-analysis to evaluate the adequacy and strength of the empirical evidence on the impact of phonemic

awareness instruction on reading development. The NRP found 52 studies that met the following criteria: 1) students were trained in phonemic awareness, 2) included a control group, and 3) measured the impact of phonemic awareness on reading outcomes. The meta-analysis revealed strong effect sizes for both the immediate and long term effects of phonemic awareness training on phonemic awareness skill, indicating that phonemic awareness can be taught. Moderate effect sizes were found for reading and spelling after phonemic awareness training. Additionally, results indicated that teaching phonemic awareness in small groups was more beneficial than individual or whole class instruction. The Panel found that training in phonemic awareness was "the cause of improvement in students' phonemic awareness, reading, and spelling performance following training" (p. 2-29).

Although phonological awareness has been found to have predictive value in reading acquisition, a causal connection has yet to be established. Castles and Coltheart (2004) questioned the claims that phonological awareness has a causal relationship with reading. In their review of phonological awareness studies, Castles and Coltheart sought to determine 1) if longitudinal studies of phonological awareness measured before acquisition of reading skill are able to predict reading performance, and 2) if training studies reveal that phonological awareness instruction facilitates reading acquisition. Their examination of longitudinal studies of phonological awareness led to questions regarding which particular aspects of phonological awareness and what size of the phonological unit predicts reading and spelling. Castles and Coltheart's (2004) review of longitudinal studies produced the following conclusion:

> …if phonological awareness indeed plays a causal role in reading and spelling acquisition, the nature of that awareness is most likely to be the ability to perceive and manipulate phonemes. No study that we selected for close scrutiny and that included phonemic awareness measures failed to find evidence for a significant unique contribution to subsequent reading or spelling. (p. 91)

Their examination of phonological awareness training studies produced a similar conclusion that no single study conclusively demonstrated that phonological awareness assists in reading and spelling acquisition. Although they found some studies that were strongly suggestive of a causal connection, Castles and Coltheart recommended that causality is unlikely to be established unless pure non-readers make up the study sample.

Training in phonological awareness

Research provides substantial documentation for the ability to teach phonological awareness skills (Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1993; Lundberg, Frost, & Petersen, 1988; O'Connor, Jenkins, Leicester, & Slocum, 1993). For example, Bradley and Bryant (1983) examined the link between phonological awareness and reading skills. The longitudinal study focused on three aspects of phonological awareness: student phonological awareness level prior to training, the effectiveness of the training in increasing phonological awareness skills, and subsequent reading outcomes. Bradley and Bryant found that students who attained higher levels of phonological awareness performed better on subsequent word reading measures.

In a later study, Byrne and Fielding-Barnsley (1993) provided 12 week phonological awareness program to preschool students. Students were taught to discriminate individual sounds in the initial or final position. In all, five consonant sounds and one vowel sound were taught using poems, picture cards, and place of

articulation (discovering how the sound is formed in the mouth). Byrne and Fielding-Barnsley found that children who received phonological awareness instruction significantly outperformed the control group on measures of phonological awareness. Additionally, they concluded that instruction in individual phonemes increases awareness of taught and untaught sounds.

Lundberg, Frost, and Petersen (1988) examined the effects of phonological awareness training on pre-literate children. In a longitudinal study of 390 kindergarten students through second grade in Denmark, Lundberg et al. examined whether performance on phonological awareness tasks in kindergarten would significantly contribute to later reading achievement. The students were divided into two groups: treatment (n=235) and control (n=155). The treatment group received daily, whole group instruction throughout the school year emphasizing rhyming, syllable segmentation, and identification of initial and final phonemes. Both groups were pre- and post tested on measures of pre-reading ability, letter knowledge, vocabulary, and language comprehension. At post test, the treatment group outperformed the control group in pre-reading ability, indicated by some word reading ability. No significant difference was found between the groups on letter knowledge or language comprehension. The treatment group exhibit effects of phonological training by outperforming the control group in phonological awareness tasks at the end of kindergarten. Effects of the training for the treatment group created a slight advantage over the control on first grade reading skills. Lundberg and colleagues (1988) concluded that phonological awareness may not develop spontaneously and students benefit from explicit instruction.

Brennan and Ireson (1997) compared the effects of direct versus implied phonological awareness instruction. Three kindergarten classrooms participated in the study. The treatment classroom (n=12) received instruction in metalinguistic games focusing on awareness of sound, rhyme production, sentence and syllable segmentation, and finally, awareness of phonemes. Control group 1 (n=14) used a reading and writing curriculum that focused on sounds in words and their relation to written symbols. Control group 2 (n=10) continued with the prescribe school curriculum. Pre and post measures of word reading, vocabulary, metaphonological knowledge, rhyme, sentence segmentation, syllable blending and segmentation, and phoneme deletion, segmentation, and blending were administered to all three groups. Results showed that the treatment group outperformed both control groups on phoneme deletion, segmentation, and blending. Additionally, significant effects for all metaphonological tests were found for the treatment group. Students in the treatment group and control group 1 performed better on word reading measures at the end of the year. Brennan and Ireson (1997) concluded that explicit instruction in phonological awareness is necessary at the kindergarten level.

Training in phonological awareness with alphabetic principle

Phonological awareness has a specific relationship with alphabetic writing systems. Research shows that the awareness of spoken language may be essential in learning to read and spell in alphabetic languages (Ball & Blachman, 1991). Additionally, it has been found that the effect of phonological awareness training is especially potent when taught in conjunction with the alphabetic principle. The

alphabetic principle is defined as “the understanding of the nature of the relationships between sounds and the letters in the written code” (Silva & Alves-Martins, 2002, p. 466). A complete understanding of the alphabetic principle depends on associations made between phonemic awareness, phonics knowledge, and how phonemes relate to letters (Adams, 1990).

In a recent meta-analysis, Bus and van IJzendoorn (1999) found that training in pure phonological awareness is less effective than when phonological awareness is combined with letter-sound knowledge. The meta-analysis revealed that training in phonological awareness and letters resulted in gains not only in phonological awareness but in pseudoword reading as well. Bus and van IJzendoorn concluded that although phonological awareness is necessary in the very beginnings of literacy acquisition, it may not be the single best predictor of reading achievement. The inclusion of letter knowledge tends to boost the predictive value of phonological awareness.

In a 1991 study, Ball and Blachman examined the effect of phonological awareness training on student reading achievement. Ninety kindergarten students were randomly assigned to one of three groups: phoneme training, language activity, and control. The phoneme training group was divided into small groups and received instruction on 4 days a week for 20 minutes. Instruction included phoneme segmentation activities (Say it and move it), letter naming activities, and letter-sound activities. The language activities group received small group instruction for the same amount of time. Their instruction included listening activities, vocabulary learning, and categorization

activities in addition to the same letter-sound instruction given in the phoneme group. The control group did not receive any additional instruction.

After 7 weeks of training, all students were tested on phoneme segmenting, letter names and sounds, and the Woodcock Reading Mastery Word Identification subtest (Woodcock, 1987). The students were also measured on the reading of phonetically regular words and spelling. Ball and Blachman found a statistically significant difference between the three groups. The results indicated that the phoneme group performed significantly better than the language and control groups on phoneme segmentation. There was no significant difference between the language group and the control group on this measure. For letter names and sounds, there was no statistical difference between the three groups on letter naming. However, the phoneme and language groups performed similarly in letter sound knowledge and significantly outperformed the control group. In word reading and spelling, the phoneme group once again significantly outperformed the language and control groups, for which there was no difference. Ball and Blachman concluded that training in phoneme segmentation in conjunction with letter sound knowledge facilitates early reading skills and may be more effective than less explicit instructional methods (i.e. pure phonological awareness training). This study supported the explicit instruction of phonemic awareness and letter sound knowledge at the kindergarten level as a means of enhancing reading acquisition.

In a later study, Blachman and colleagues (Blachman, Ball, Black, & Tangel, 1994) studied the effect of phonological awareness and alphabetic understanding training on a group of low performing, low income, inner-city kindergarten students'

(n=159) word recognition and spelling over a two year period. The treatment group (n=84) received 11 weeks of training in phoneme segmentation, letter naming and letter sounds in small groups (adapted from Ball, & Blachman, 1991). The control group (n=75) did not receive any additional instruction. After the 11 week intervention, the treatment group performed significantly better than the control group on phoneme segmentation, letter sound knowledge, reading of real and pseudo words, and developmental spelling.

In an extension to the 1994 study, Blachman, Tangel, Ball, Black, and McGraw (1999) followed the treatment group to first grade where they received systematic explicit instruction that reinforced phonemic awareness and emphasized the alphabetic code. The control group received instruction from the basal reading series adopted by the district. At the end of first grade, both groups were measured on phoneme segmentation, letter name and letter sound knowledge, Woodcock Reading Mastery Word Identification subtest (Woodcock, 1987), test of regular word reading, the Decoding Skills Test Phonic Patterns subtest (Richardson & DiBenedetto, 1985), and an experimenter devised spelling test. Blachman et al. found that the treatment group again scored significantly higher than the control group on phoneme segmentation, letter naming, letter sound knowledge, and word reading and spelling. At the end of second grade, Blachman et al. found that the treatment group still outperformed the control group on word identification and spelling. The researchers concluded that kindergarten students who receive phonemic awareness and alphabetic instruction, followed by

explicit systematic code based instruction in first grade were at a significantly greater advantage in reading at the end of grades 1 and 2.

Foorman and colleagues reached similar conclusions about the effects of phonological awareness training and alphabetic instruction on early reading skills. Foorman, Francis, Fletcher, Schatschneider, and Mehta (1998) examined the effects of three instructional approaches on Title 1 first and second grade students (n=285) reading achievement. Students were divided into three groups based on instructional approach: direct code, which included a balance of phonemic awareness tasks and explicit instruction in the alphabetic principle; embedded code, which was a less direct emphasis on phonemic awareness and spelling patterns; the final group, implicit code, emphasized a print rich environment and teacher as facilitator of learning.

Foorman et al. assessed word reading, phonological processing, and vocabulary four times over the course of the school year. At year end, they also administered an intelligence measure and a reading achievement measure. Their results showed that the direct code group achieved higher levels of growth in phonological processing than the other instructional methods. Likewise, the direct code group performed significantly better at word reading than the implicit code group. There was no significant difference between the groups on vocabulary growth. On end of the year measures of reading achievement, the direct code group scored higher on decoding and passage comprehension than the other instructional groups. Foorman et al. (1998) concluded that direct, explicit code based instruction is vital to the intervention and prevention of reading failure.

In a similar study, Foorman and colleagues (2003) examined the effects of phonological awareness training when integrated with code instruction on kindergarten students (n=4,872) at risk for reading failure. The 114 classrooms in 32 schools included in the study were grouped based on curriculum type and were compared on measures of vocabulary and literacy knowledge. The results indicated that students who received curriculum based on training in phonemic awareness and explicit alphabetic principle instruction performed better in word reading at the end of grade 1 than students who received other curriculum types (Foorman, Chen, Carlson, Moats, Francis, & Fletcher, 2003).

Fuchs, et al. (2001) examined the effectiveness of phonological awareness with and without the inclusion of the alphabetic principle. Thirty-three kindergarten teachers were randomly assigned to one of three groups: phonological awareness, phonological awareness with decoding, and control. Each of the two treatment groups received instruction for 20 weeks. Data were collected for 404 students' pre and post treatment. Results showed that the two treatment groups performed similarly on measures of phonological awareness at the end of kindergarten and outperformed the control group. On measures of alphabetic knowledge, the phonological awareness with decoding group outperformed both the phonological awareness and control groups. The phonological awareness group and control group performed similarly on measures of alphabetic knowledge. In a follow up at the beginning of first grade, Fuchs et al. found that the treatment groups still outperformed the control group on measures of phonological

awareness, but there was no longer a statistically significant difference between the three groups on alphabetic knowledge.

Approaches to Phonics Instruction

Phonics is "a method of instruction that teaches students correspondences between letters in written language and phonemes in spoken language and how to use these correspondences to read and spell words" (Ehri, 2004, p. 167). Research has repeatedly shown that phonics instruction should be highly systematic (Ehri, Nunes, Stahl, et al., 2001). The NRP (NICHD, 2000) identified six types of systematic phonics instruction: synthetic phonics, analytic phonics, phonics through spelling, embedded phonics, onset and rime phonics, and analogy phonics. Synthetic phonics programs teach students to systematically apply and blend letter-sound correspondences. In contrast to synthetic phonics, analytic phonics focuses on teaching students to analyze the constituent sounds after they have identified the word. The phonics through spelling approach teaches students translate phonemes into graphemes to write words. Embedded phonics emphasizes using context in addition to letter-sound correspondences to identify unfamiliar words. Onset and rime phonics and analogy phonics are similar approaches that teach students to use word parts that they already know to decode new words. The present study used a synthetic approach to phonics instruction.

Although each of the previous approaches to phonics instruction is considered explicit and systematic, they are qualitatively different in a variety of ways. Ehri (2004) indicated that phonics programs differ in the number and sequence of letter-sound relationships taught; whether the program incorporates the teaching of phonic

generalizations; the amount of phonological awareness; the use of direct instruction or problem-solving and the students' role in phonics instruction. The programs used in this study vary in all of the aforementioned ways (See Chapter III and Appendix A).

The NRP's meta-analysis (NICHD, 2000) synthesized the research findings on systematic phonics instructions. They determined that systematic phonics instruction is more effective than other phonics approaches or no phonics instruction. Research indicated that students who received systematic, explicit phonics instruction read more words at the end of the first year of instruction than students who received unsystematic phonics or no phonics instruction. The meta-analysis also revealed the phonics instruction is beneficial for young readers. Effects for kindergarten and first grade were statistically larger for facilitating reading acquisition than for second through sixth graders.

Letter Naming and Accuracy

In addition to phonological awareness, letter naming has been found to be one of the best predictor of future reading ability. Students' ability to attach names to letters in the early grades is significantly correlated with word reading skills (Lonigan, Burgess, & Anthony, 2000; McBride-Chang, 1999; Muter & Snowling, 1998; Share, Jorm, Maclean, & Matthews, 1984; Wagner, Torgesen, & Rashotte, 1994). Additionally, letter naming ability in kindergarten has been found to correlate with reading in later grades (Badian, 1995). The effect of letter name knowledge on later reading ability is not unique to the English language but has also been established in other alphabetic languages as well (Elbro, Borstrom, & Peterson, 1998; Read, Zhang, Nie, & Ding, 1986).

In their 2000 study, Lonigan et al. examined the development of early reading skills from preschool through first grade. Longitudinal data from two samples were collected at various points in the study. Group one consisted of 96 preschool students who were followed throughout preschool. Group two consisted of 97 preschoolers whose reading development was followed through kindergarten and first grade. The purpose of the study was to determine the developmental significance of phonological sensitivity and other early literacy skills. The researchers assessed phonological sensitivity (i.e. rhyming oddity task, blending of syllables and phonemes, and deletion of phonemes), oral language and cognitive abilities, letter name and sound knowledge, environmental print knowledge, concepts of print, and word reading for both groups of students. Results indicated that phonological sensitivity and letter name knowledge accounted for 54% of the variance in decoding ability in kindergarten and first grade. Additionally, letter naming knowledge in the later preschool years accounted for 72% of the variance in kindergarten and first grade letter knowledge.

In addition to predicting later word reading ability, being able to name the letters provides children with a clue to the letter-sound correspondence for most letters. For example, the letter name B incorporates its sound /b/ in its name. Letter name instruction allows students to begin to make connections between the sounds in our language and the written representation of those sounds for both reading and spelling. Research has indicated that letter naming ability and letter sound knowledge are related but separate skills. In fact, it has been shown that letter sound knowledge is facilitated by letter name knowledge.

McBride-Chang (1999) examined the relationship of letter name and letter sound knowledge to subsequent reading skills in non-readers (n=91) from kindergarten to first grade. The purpose of this study was two-fold: first, to determine if letter name and letter sound knowledge were definite, separate skills, and second, to determine if letter name facilitates letter sound knowledge at various levels of difficulty. Students' letter name knowledge, letter sound knowledge, phonological awareness, and word identification were measured four times in the course of the study. McBride-Chang also administered measures of general cognitive ability at time 1, spelling at times 2, 3, and 4, and at time 4 only, word attack. Results showed that letter naming knowledge at time 1 was highly correlated with letter naming at times 2, 3, and 4. Additionally, previous letter naming and letter sound knowledge was found to predict later letter sound knowledge. Letter sound knowledge was also found to be more highly associated with all other reading measures than letter name knowledge. From the findings, the researcher concluded that letter name knowledge and letter sound knowledge are separate abilities, letter naming is predicted only by letter naming, whereas letter sound knowledge was predicted by both letter name and letter sound, and finally, letter knowledge is facilitated by letter name knowledge at various difficulty levels.

In an earlier study, Treiman, Tincoff, and Richmond-Welty (1996) also examined the relationship between letter name and letter sound. They asked preschool students (n=16) to name the initial or final letter of words that either incorporated the letter name (/bi/ in beach) or the letter sound in the pronunciation (/f/ in loaf). The beginning condition consisted of 36 words divided into six categories: Correct letter name, which

began with the letter name (beach, jail), correct letter name control, which began with the correct sound for the letter (bone, June), wrong letter name, which began with a letter that sound was the name of a different letter (wife, seem), wrong letter name control, which began with the correct sound for the letter followed by a long vowel, and finally, false letter name, which consisted of words whose initial sound did not form the name of a letter in the English alphabet (feed, green) and false letter name control, which began with the letter sound followed by /o/ or /u/ (folk, group). The end condition also consisted of 36 words. In this condition, the words were divided into four categories: correct letter name, correct letter name control, false letter name, and false letter name control. These categories were designed the same as the beginning condition but focusing on the letter name of the final letter. The researchers also measured naming of letters and identification of letter sounds.

Treiman et al. found that students more accurately named initial or final letters for words in the letter name category than in the letter name control category, finding significant effects for word type and position. Additionally, students were 13 percent better at naming letters when the word incorporated the letter name than when the word incorporated letter sound only. The wrong letter name stimuli revealed significant effects for word type and phoneme, indicating that students were more likely to name the wrong letter in words that began with a sound that was also a letter name (i.e. identifying y as the initial letter in wife). There were no significant effects for false letter name stimuli and control. Finally, results for letter naming and letter sound identification showed that preschool children were better at naming letters than identifying their corresponding

sounds. The authors concluded that letter names help children understand the relationship between the spoken sound and the written representation of that sound.

The fluency with which children name letters is also predictive of later reading achievement. Decades of research found compelling evidence that rapid naming of highly familiar visual symbols (i.e. letters) is strongly related to reading achievement (Ackerman, & Dykman, 1993; Blachman, 1984; Denckla & Rudel, 1976; Ellis, 1985; Felton & Brown, 1990; McBride-Chang & Manis, 1996; Wolf, 1991; Wolf, Bally, & Morris, 1986). Many studies have found that letter naming speed is a significant predictor of variance in reading, after phonological awareness is accounted for (Blachman, 1984; Mann, 1984; Wagner, Torgesen, Laughon, Simmons, & Rashotte, 1993; Wimmer, 1993). In fact, letter naming is significantly correlated with word recognition (Blachman, 1984) and reading comprehension (Speer & Lamb, 1976).

Blachman (1984) examined the relationship between rapid naming and language analysis skills in kindergarten (n=34) and first grade (n=34). Measures of naming speed for colors and objects were administered to all students, with the addition of naming of letters for first grade. Results indicate that naming of colors in kindergarten is predictive of first grade reading achievement. Additionally, naming speed of colors and letters in first grade predicted first grade word recognition. In a similar study, Badian (1993) measured the relationship of naming speed in six to eight year olds (n=118) to reading achievement. Badian found that rapid naming of letters, numbers, and objects correlated with later word recognition skills. Likewise, it was found that naming speed for letters differentiates good and poor readers.

In a recent study, Schatschneider, Carlson, Francis, Foorman, and Fletcher (2002) examined the relationship of rapid naming and early reading development. In a longitudinal study, Schatschneider et al. followed 362 students through first and second grade. Measures of phonological awareness, rapid naming of letters, word identification, passage comprehension, and word reading efficiency, measured by the rapid reading of real and pseudo-words, were administered in April of first grade and again in April of the following year. For first grade students, rapid naming of letters is predictive of word identification, accounting for 13% of the variance. Additionally, first grade rapid naming of letters explains 22% of the variance in word reading efficiency after phonological awareness is accounted for. In second grade, rapid naming was found to have less contribution to the overall variance in reading. Results showed that rapid naming of letters accounted for 19% of the variance in word reading efficiency and was less predictive for decoding and comprehension. The researchers concluded that because naming speed is highly correlated with phonological awareness, the two skills may be inseparable. Additionally, they also concluded that naming speed was more closely related to reading fluency than word identification.

Summary

This chapter has identified three vital aspects of early literacy instruction. Phonological awareness plays an important role in developing reading skills. Although it is not solely responsible for creating good readers, it has been shown to be a potent predictor of later reading ability. The teaching of phonological awareness skills with the alphabetic principle produced greater gains in reading achievement than phonological

awareness alone. The alphabetic principle is best taught through systematic phonics instruction. Finally, the ability to identify letters has been found to be just as important in early literacy as phonological awareness skills.

CHAPTER III

METHODOLOGY

The purpose of this study was to investigate the effectiveness of teacher implemented explicit, systematic instruction in letter naming, phonological awareness, and the alphabetic principle on literacy acquisition. Kindergarten and first grade levels were chosen due to the appropriateness of instruction in these skills as prerequisites for literacy acquisition.

Participants

Intact kindergarten and first grade classes were chosen from a school district in the southwestern United States. The district was considered academically acceptable according to the state rating system. It had an approximate enrollment of 1500 students during the 2004-2005 school year. Its faculty included 10 administrators, 116 teachers, and 25 instructional aides. It is located in a rural area 73 miles west of the state's largest city. The town's population according to the 2000 census was 3916. Due to the longitudinal nature of this study and use of a historical comparison group, the participants are discussed in terms of cohorts. Both cohorts were followed through the end of first grade. The classes being used in the study are intact groups of students and therefore random assignment of individual students was not possible.

Cohort 1 (n= 94) consisted of students who attended kindergarten during the 2003-2004 school year. Males comprised 53.2% (n=50) and females 46.8% (n=44) of the sample. The ethnic composition was 55.7% White (n=52), 25.7% Hispanic (n=24), 18.2% African American (n=17), and 0.4% Asian (n=1). The percentage of the school

population who received free or reduced lunch was 50.9% (n=48). Students whose first language was not English comprised 11.3% of the population (n=11). The average year's experience of teachers was 14.3 years. Cohort 1 served as the comparison group for this study. Due to a 17% attrition rate, the number of students in Cohort 1 was 78 at the beginning of year two.

Cohort 2 (n= 96) consisted of students from the same school who attended kindergarten during the 2004-2005 school year in the classrooms of the same teachers from Cohort 1. Male students made up 53.1% (n=51) and females 46.9% (n=45) of the sample. The ethnic composition of the population was 52% White (n=50), 26.6% Hispanic (n=25), 20.8% African American (n=20), and 0.6% Asian (n=1). The percentage of students receiving free and reduced lunch was 54.3% (n=52) and students whose first language was not English comprised 11.4% (n=11) of the population. Average length of teaching experience was 14.8 years. Cohort 2 served as the treatment group for this study. Cohort 2 had an attrition rate of 16% (n=81) for year two.

During the years studied, there were no changes to the kindergarten and first grade teaching staff or the school administration. The only change made during the study was the addition of the teacher implemented literacy programs used with Cohort 2. All students were assessed by the regular classroom teacher during the course of the regular school day. Since all data was collected by the school as part of their yearly assessments, parental permission for testing was not necessary. However, parents were informed of the school's participation in the study. No students were excluded from the study based

on language or special education status. Selection of classes was based on access to the school and the school's willingness to participate in the study.

Procedures

Cohort 1 received regular classroom instruction for 90 minutes of daily language arts instruction during both kindergarten and first grade. The kindergarten and first grade teachers did not receive any specific program related training. They used the district adopted, state approved reading curriculum (hereafter called basal series). This curriculum provided instruction in letter recognition, phonological awareness, letter-sound correspondences, listening and language skills, reading comprehension, and written expression. According to the publisher, the program uses a balanced approach to literacy instruction. It uses a variety of literature selections, decodable texts, and leveled independent readers. It also provided instruction in phonics through direct instruction using workbook activities and decodable reading selections. Each weekly unit contained daily lessons focused on phonological awareness and phonics, reading of literature, and comprehension strategies. Teachers are able to choose the daily lessons from each unit that they wish to use. Appendix A gives further description of instruction covered by this program at kindergarten and first grade levels.

Cohort 2 received instruction in phonological awareness, letter knowledge, and the alphabetic principle using a research based program designed to be highly explicit and systematic as part of the language arts program in addition to the basal series. During January, 2005, the kindergarten teachers received training in the Neuhaus Reading Readiness program (Neuhaus Education Center, 2002) during a one-day, six

hour seminar conducted during the school day on the school campus. The kindergarten teachers implemented the Reading Readiness program in their classroom for thirty minutes of their 90 minute daily language arts instruction with all students for the remaining 14 weeks of the school year.

The Reading Readiness program (Neuhaus Education Center, 2002) was designed to enhance reading and spelling acquisition in young children by providing instruction in the prerequisite literacy skills of phonological awareness, letter recognition, and oral language. The program includes five components: letter recognition, phonological awareness, explicit letter-sound introduction, handwriting, and oral language. Because the present study is particularly interested in the effect of letter recognition, phonological awareness, and letter-sound instruction on kindergarten literacy achievement, a brief review of these components follow.

Reading Readiness incorporated activities designed to enhance both the acquisition of instant letter recognition skills and alphabetical order knowledge. Instant letter recognition is a strong predictor of future reading achievement (Snow, Burns, & Griffin, 1998). Activities included in Reading Readiness provide opportunities for students to match letters, name letters individually, sequence letters, rapidly name series of letters, and examine the unique characteristics of each letter. Each activity is designed for varying ability levels and provides explicit learning of the alphabet.

The second component of Reading Readiness is phonological awareness. Much evidence is available regarding the role of phonological awareness in learning to read. Reading Readiness included activities for rhyme identification, alliteration practice,

sentence segmentation, syllable segmentation and blending, onset and rime segmentation and blending, and finally, phonemic awareness. Some phonemic awareness activities used in the program include segmenting of words into phonemes and blending phonemes into words. Finally, Reading Readiness included activities to link phonological awareness to letter-sound correspondences.

The linking of phonological awareness to letter-sound correspondences is an important step in teaching students the relationship between spoken language and written language. The Reading Readiness program integrated phonological awareness instruction with systematic, explicit phonics instruction. Systematic phonics instruction has been identified as an essential part of teaching beginning readers (NICHD, 2000). Additionally, Harris and Hodges (1995) explained that systematic phonics instruction stresses the acquisition of the alphabetic principle and the use of letter-sound correspondences to read and spell words. It has been found that reading programs that incorporate systematic phonics instruction produce significant gains in word recognition, spelling, and vocabulary in the early grades (Chall, 1967). Reading Readiness systematically introduced each of the 26 letters of the alphabet based on their frequency of use in early reading and spelling. Additionally, it separated easily confused sounds and letter shapes. This order of presentation optimized the number of words children can read after only a few lessons. For example, after the first ten letters are introduced, students should be able to read over 100 words (personal communication, Neuhaus Education Center, 2005).

Implementation of the Reading Readiness program is quite straightforward. In addition to the initial one-day training session provided by Neuhaus Education Center, teachers received a program manual that included detail explanations of all activities. Support personnel from Neuhaus were also available to answer questions regarding classroom implementation. The program is designed to take 30 minutes and can be used in addition to or in place of other literacy programs. Each 30 minute lesson includes five minutes of letter recognition activities, five minutes of phonological awareness, ten minutes of letter-sound instruction, five minutes of handwriting, and five minutes of oral language development. The activities are designed to fit easily into classroom practices and routines. The training staff from Neuhaus Education Center conducted fidelity checks (three times over the course of 14 weeks) to insure the program was properly implemented.

During the summer of 2005, the first grade teachers received training in the Neuhaus Language Enrichment program (Neuhaus Education Center, 2000). Language Enrichment was implemented as part of the first grade language arts instruction beginning in October of 2005 in addition to the basal series. The Language Enrichment (Neuhaus Education Center, 2000) is a comprehensive three-year classroom reading program designed to directly and explicitly teach the patterns of the English language. It is specifically designed to supplement basal reading or guided reading programs. Year One teaches sound-symbol correspondences, syllable types, syllable division, and suffixes. Year Two begins with a review of year one, followed by more sound-symbol correspondences, prefixes, suffixes, and extra practice with syllable division patterns.

Year Three reviews all previously learned material, in addition to focusing on Latin roots and Greek combining forms (see www.neuhaus.org). Each year of the scope and sequence also incorporates special instruction in reading fluency using repeated readings aimed at improving accuracy, speed, and prosody. Use of the Language Enrichment program requires 30 hours of in-service training and a comprehensive user manual. The Language Enrichment program is designed for use through third grade, however, for the purpose of this study only year one was utilized. A brief description of the year one components of Language Enrichment follows.

Year one of Language Enrichment incorporates phonological awareness activities with explicit, systematic letter-sound instruction with a focus on reading fluency. Each daily lesson teaches or reviews a new concept. New concepts consist of learning letter-sound correspondences, one of the six syllable types, syllable division patterns, or word parts (typically, morphological units such as prefixes, suffixes, and roots). In addition to learning new concepts, students review previously learned material, learn sight words, and practice rapid reading of decodable words.

The daily lesson plan for Language Enrichment is designed to take 30-40 minutes. The first step is daily review of previously learned sound-symbol correspondences and recognition of word parts. Students are presented with flashcards that give a letter and a keyword picture. The students identify the name of the letter, the keyword, and the sound for each card. This review should take approximately three minutes. After the review, the teacher introduces a new concept which is organized to systematically cover the structure of English. Introduction of the new concept takes five

minutes. Students then spend 5 to 10 minutes in reading practice, either reading words in isolation or in connected text. This activity promotes instant word recognition, fluency, and accuracy. The remaining 15 to 20 minutes of the lesson focuses on oral language development and listening comprehension. These activities increase oral language skills, world knowledge, and vocabulary as well as incorporating comprehension strategies, such as text organization, summarization, and retelling. Again, training staff from Neuhaus Education Center conducted fidelity checks (four times over the course of the school year) to insure proper program implementation. See Appendix A for further description of topics covered by these programs.

Instruments

The Texas Primary Reading Inventory (TPRI, Texas Education Agency, 2002) was administered twice during kindergarten. The first administration for both groups took place during January of the school year (2003-2004 and 2004-2005). For the treatment group (Cohort 2), testing was prior to implementation of the Reading Readiness program. The second administration was during May. The Kindergarten TPRI assesses letter knowledge, letter-sound knowledge, phonological and phonemic awareness, and listening comprehension. The TPRI at the kindergarten level includes two screeners: one measures graphophonemic knowledge, the other measures phonological awareness. Students who do not meet the benchmark criteria for the screeners take the complete inventory, which consists of five phonological awareness tasks, two graphophonemic knowledge tasks, and a listening comprehension task. Table 1 describes the kindergarten screening and inventory tasks.

TABLE 1
KINDERGARTEN TPRI SCREENING AND INVENTORY TASKS

Screening	Description
Graphophonemic Knowledge	10 items; measures letter name knowledge and letter sound knowledge; benchmark – 4 or more
Phonological Awareness	8 items; measures blending of onset-rimes and individual phonemes; benchmark – 6 or more
Task 1 Rhyming	5 items; measures ability to generate rhyming words; benchmark – 4 or more
Task 2 Blending Word Parts	5 items; measures ability to blend onset-rime and phonemes into words; benchmark – 4 or more
Task 3 Blending Phonemes	5 items; measures blending of phonemes into words; benchmark – 4 or more
Task 4 Detecting initial sounds	5 items; measures deletion of initial phonemes; benchmark – 4 or more
Task 5 Detecting final sounds	5 items; measures deletion of final phonemes; benchmark – 4 or more
Task 6 Letter name identification	26 items; measures naming of all 26 letters in random order; benchmark – 20 or more
Task 7 Letter to sound linking	10 items; measures identification of initial sound and letter name; benchmark – 8 or more
Task 8 Listening Comprehension	5 items; measures explicit and implicit listening comprehension

The test/retest reliability (normed on a kindergarten student population) for the constructs measured are reported as .95 for letter knowledge, .87 for letter-sound knowledge, ranging from .51 to .84 for the multiple subscales and measures for phonological and phonemic awareness measures, and ranging from .46 to .63 for the three scales used to measure listening comprehension. Dependent on the task items

within the assessment that students are asked to perform the validity coefficients for the TPRI are reported in ranges as follows: .19 to .95 for letter knowledge, .39 to .86 for letter-sound knowledge, ranging from .10 to .88 for the multiple subscales and measures for phonological and phonemic awareness measures, and ranging from .09 to .65 for the three scales used to measure listening comprehension. The TPRI is generally considered technically sound, however, the reliability for several inventory tasks is below acceptable levels (Rathvon, 2004). Despite the TPRI's low reliability ranges, Rathvon (2004) indicated the TPRI tasks appear to measure "the same construct as the norm-referenced and criterion-referenced instruments from which they are derived" (p. 293). Additionally, Rathvon cited that the TPRI is currently administered in over 95% of Texas schools.

The TPRI was administered to both cohorts of first grade students in September, January, and May of the school year (2004-2005 and 2005-2006). The first grade TPRI assesses letter name knowledge, letter sound knowledge, phonological awareness, word reading, fluency, and reading comprehension. It includes five screeners, ten inventory tasks, a fluency measure, and a reading comprehension measure (See Table 2).

TABLE 2
FIRST GRADE TPRI SCREENING AND INVENTORY TASKS

Screening	Description
Graphophonemic Knowledge	10 items; measures letter name knowledge and letter sound knowledge; benchmark – 8 or more
Word Reading	8 items; measures word reading in isolation; benchmark – 3 or more
Phonemic Awareness	6 items; measures blending of individual phonemes; benchmark – 5 or more
Word Reading End of the year	8 items; measures word reading in isolation; benchmark – 5 or more
Phonemic Awareness End of the year	6 items; measures blending of individual phonemes; benchmark – 5 or more
Task 1 Blending Word Parts	5 items; measures ability to blend onset-rime and phonemes into words; benchmark – 4 or more
Task 2 Blending Phonemes	5 items; measures blending of phonemes into words; benchmark – 4 or more
Task 3 Detecting initial sounds	5 items; measures deletion of initial phonemes; benchmark – 4 or more
Task 4 Detecting final sounds	5 items; measures deletion of final phonemes; benchmark – 4 or more
Task 5 Initial consonant substitution	5 items; measures identification of initial letter based on sound; benchmark – 4 or more
Task 6 Final consonant substitution	5 items; measures identification of medial vowel based on sound; benchmark – 4 or more
Task 7 Middle vowel substitution	5 items; measures identification of final letter based on sound; benchmark – 4 or more
Task 8 Initial blend substitution	5 items; measures identification of initial blend based on sound; benchmark – 4 or more
Task 9 Final blend substitution	5 items; measures identification of final blend based on sound; benchmark – 4 or more
Task 10 Word Reading	15 items; measure word reading in isolation; determines story placement for reading comprehension task
Task 11 Reading Comprehension and Fluency	6 items; measures words correct per minute and explicit and implicit reading comprehension

The test/retest reliability (normed on a first grade student population) for the constructs measured are reported as ranging .70 to .84 for the seven subtests of letter-sound knowledge, ranging from .66 to .89 for the multiple subscales and measures for phonological and phonemic awareness measures, and ranging from .42 to .69 for the scales used to measure reading comprehension.

In addition to the first grade end of year TPRI, the Iowa Test of Basic Skills, level 6 (ITBS, Hoover et al., 2001) was administered in May of first grade. The ITBS measures many academic skills, but for the purpose of this study, only the vocabulary, word analysis, reading comprehension, listening, and language subtests were utilized. The vocabulary test measures listening vocabulary by having the student choose the corresponding picture from three choices. The word analysis test measures a student's ability to identify letters and letter-sound relationships. Reading comprehension is measured using a variety of tasks such as using pictures to provide the missing word in a sentence and answering multiple choice questions after reading a passage. Listening is measured by having the student choose the appropriate picture that corresponds with the oral scenario they have heard. The scenarios include following directions and sequencing. Finally, the language test is a composite score based on a student's spelling ability and written expression. It measures spelling, written mechanics and usage.

The ITBS is a highly recognized and regularly used measure of academic achievement. Table 3 outlines the reliability reported for the age group associated with a first grade population for the subtests of the ITBS.

TABLE 3
RELIABILITY COEFFICIENTS FOR SUBTESTS OF THE ITBS

Subtest	Reliability coefficient range
Vocabulary	.725 to .886
Word Analysis	.800 to .853
Reading Comprehension	.889 to .910
Listening	.699 to .758
Language	.786 to .869

Implementation

Due to the retrospective and longitudinal nature of the study, it is important to understand how and when the study was carried out for each cohort of students.

In September 2003, the students in Cohort 1 entered kindergarten. The kindergarten teachers began literacy instruction using the basal series. In January of 2004, the middle of the year kindergarten TPRI was administered to Cohort 1. Literacy instruction using the basal series continued and in May, 2004, the end of the year kindergarten TPRI was administered to Cohort 1. In September, 2004, Cohort 1 entered first grade and the beginning of the year first grade TPRI was administered and instruction continued using the basal series. The middle of the year first grade TPRI was administered in January, 2005 to Cohort 1. Then in early May, both the ITBS and the

end of the year first grade TPRI were administered to Cohort 1, which concluded their participation in the study.

In September, 2004, Cohort 2 entered kindergarten and received literacy instruction through the basal series. The kindergarten teachers were trained through Neuhaus Education Center to use the Reading Readiness program in January, 2005. Also in January, the kindergarten middle of the year TPRI was administered to Cohort 2. Following this testing, the teachers began using Reading Readiness in addition to the basal series. In May, 2005, the kindergarten end of the year TPRI was administered. During June, 2005, the first grade teachers were trained by the staff at the Neuhaus Education Center to use Language Enrichment. Cohort 2 entered first grade in September, 2005, and the first grade beginning of the year TPRI was administered. At this time, instruction using Language Enrichment, in addition to the basal series, commenced. In January, 2006, the first grade middle of the year TPRI was administered. Finally, in early May, 2006, both the ITBS and the first grade end of the year TPRI were administered to conclude the study. Fidelity checks were conducted for Cohort 2 by the Neuhaus Education Center staff in February, 2004, March, 2004, April, 2004, October, 2004, December, 2004, February, 2005, and April, 2005. See Appendix B for the forms used during fidelity observations.

Observations of Treatment Fidelity

Observations of Cohort 2 kindergarten and first grade classrooms were conducted 7 times between January 2005 and May 2006, using the teacher as unit of analysis. The observation protocol was developed by Neuhaus Education Center to

specifically match the literacy activities used in Reading Readiness and Language Enrichment (See Appendix B). Each observation observed 10 minutes of a thirty minute lesson. At each observation, starting time and activity were noted. Each classroom was observed on each visit resulting in 70 minutes of observation time (30 minutes per teacher in kindergarten, 40 per teacher minutes in first grade). Observations were conducted based on the availability of the observer and the school calendar. All observations were conducted by the same member of the Neuhaus Education Center training staff that delivered the in-service training for kindergarten and first grade teachers.

The results of the treatment fidelity observations for Cohort 2 are summarized in Table 4. A 5-point Likert scale was used with (1) least consistent in implementation to (5) most consistent in implementation. Scores lower than 11 indicated the teacher was inconsistent with the use of the program as designed. Scores between 12 and 17 indicated moderate consistency. Higher scores, 18 or better, indicated consistent implementation. Any scores in the high range were considered acceptable for treatment fidelity. Overall, the means score for treatment fidelity were within the acceptable range; however, one first grade teacher scored below the acceptable range of treatment fidelity on every observation.

TABLE 4
TREATMENT FIDELITY BY GRADE LEVEL

	Grade Level	
	Kindergarten	First Grade
Number of observations	3	4
Average duration of observation (in minutes)	10.3	9.8
Mean fidelity rating	20.2	18.6

Design

Cohort is the between-subjects variable consisting of two levels (i.e., a treatment group receiving systematic reading instruction as previously laid out and a comparison group receiving no systematic instruction). The dependent variable of interest is literacy achievement. Specifically, literary achievement is defined in terms of the dependent variables measured in the study: phonological awareness, word reading, letter knowledge, letter-sound correspondence, listening comprehension, fluency, vocabulary, spelling, and reading comprehension.

Data Analysis

Statistical Package for the Social Sciences (SPSS) was utilized to organize and analyze all relevant data examined in the current study. An alpha level of .05 was used to determine statistically significant differences among the groups of participants

involved in the present study. A multivariate analysis of covariance (MANCOVA) was used to analysis the student test data with status as an English language learner used as the covariate. MANCOVA was conducted utilizing the following measures of interest: phonological awareness, letter identification, word reading, letter sound knowledge, listening comprehension, vocabulary, spelling, reading comprehension, and fluency. If differences are detected between the groups, effect sizes were then computed to determine whether the differences found are of practical importance. Hierarchical linear regression was used to determine which dependent measures contributed to end of first grade reading comprehension, word reading, and fluency. Finally, because scores, not tests, are considered reliable (Thompson, 2001), reliability for the dependent variables was measured using Cronbach's Alpha.

CHAPTER IV

RESULTS

This chapter reports the results of the analyses using scores from the kindergarten TPRI, first grade TPRI, and first grade ITBS. A one-way multivariate analysis of covariance (MANCOVA) was performed on the dependent variables related to literacy achievement. The kindergarten dependent variables were as follows: blending word parts and rhyming (phonological awareness measures), letter name identification, letter-sound graphophonemic knowledge, and listening comprehension. The first grade dependent variables (depending on time of administration) were blending word parts, blending phonemes, word reading, words read correctly per minute, reading comprehension, vocabulary, word analysis, listening comprehension, and spelling. The independent variable was cohort membership and the covariate was English language learner (ELL) status.

The results of the MANCOVA are reported using Wilks' Lambda *F* values, followed by univariate analyses whenever a main effect for cohort was significant at a .05 level. Effect sizes are also reported using the eta squared statistic. According to Huck (2004), the criteria for interpreting eta squared are "as follows: less than .06 is small, .06 to .15 is medium, and greater than .15 is large" (p. 254). Contribution of the covariates, English language learner and previous statistically significant variables, on each dependent variable is discussed. Adjusted and unadjusted group means for each dependent variable are presented. Hierarchical linear regression was also used to

determine which dependent measures best predicted first grade reading comprehension, word reading, and fluency. Reliability was also measured using Cronbach's alpha.

Kindergarten

A one-way multivariate analysis of covariance was conducted on the middle of year TPRI measures to determine if the cohorts were statistically significantly different before implementation of the treatment for Cohort 2. All assumptions of MANCOVA were met and analyses were conducted using blending word parts, rhyming, letter name identification, letter sound graphophonemic knowledge, and listening comprehension as the dependent variables. Cohort was the independent variable and ELL status served as the covariate. The main effect of cohort on the combined dependent variable (DV) was not statistically significant, Wilks' $\Lambda = .973$, $F\ (5,183) = 1.008$, $p > .05$, $\eta^2 = .027$. Since statistical significance was not found between the cohorts, it can be assumed that the groups are the same on the dependent measures prior to implementation of the treatment for Cohort 2. Table 5 reports the adjusted and unadjusted means for the dependent variables.

TABLE 5
MIDDLE OF THE YEAR KINDERGARTEN ADJUSTED AND UNADJUSTED GROUP MEANS FOR COHORT

	Comparison Group		Treatment Group	
Dependent variables	Adjusted *M*	Unadjusted *M* *(SD)*	Adjusted *M*	Unadjusted *M* *(SD)*
Blending Word Parts	4.22	4.21 (3.06)	4.15	4.16 (2.99)
Rhyming	3.27	3.27 (2.02)	3.33	3.33 (1.92)
Letter name identification	22.25	22.24 (6.20)	21.59	21.59 (6.22)
Letter sound graphophonemic knowledge	7.75	7.74 (2.97)	7.97	7.97 (2.85)
Listening comprehension	3.64	3.64 (1.45)	3.44	3.44 (1.44)

Note. Covariate appearing in the model is English language learner status.
*p<.05

A one-way multivariate analysis of covariance was conducted to determine statistical significance between the cohorts on the end of kindergarten dependent measures. Box's M and Levine's test were nonsignificant indicating that the assumptions of MANCOVA were met. Analysis revealed a statistically significant difference for the main effect of cohort on the combined dependent variable when ELL status is controlled, Wilks' $\Lambda = .925$, $F(5,183) = 2.847$, $p<.05$, $\eta^2 = .072$. The effect size for the combined DV is considered moderate. The covariate, ELL status, significantly influenced the combined DV, Wilks' $\Lambda = .938$, $F(5,183) = 2.322$, $p<.05$, $\eta^2 = .062$. In the follow-up univariate

analyses to the significant multivariate finding, analyses revealed significant findings for blending word parts, letter name identification, and letter-sound graphophonemic knowledge, $F(1,187) = 5.263$, $p<.05$, $\eta^2= .029$, $F(1,187) = 6.414$, $p=0.012$, $\eta^2= .035$, and $F(1,187) = 3.918$, $p<.05$, $\eta^2= .021$, respectively. No statistically significant difference was found for rhyming and listening comprehension. Table 6 displays the adjusted and unadjusted group means for cohort. Comparison of adjusted means indicated that those who received the systematic explicit literacy instruction in kindergarten achieved higher levels of phonological awareness, letter knowledge, and letter-sound knowledge than those who did not.

TABLE 6
END OF THE YEAR KINDERGARTEN ADJUSTED AND UNADJUSTED GROUP MEANS FOR COHORT

	Comparison Group		Treatment Group	
Dependent variables	Adjusted *M*	Unadjusted *M* *(SD)*	Adjusted *M*	Unadjusted *M* *(SD)*
Blending Word Parts	6.35	6.32 (1.77)	6.77*	6.79 (1.71)
Rhyming	4.55	4.55 (.697)	4.55	4.54 (.767)
Letter name identification	25.73	25.75 (.432)	25.90*	25.83 (.374)
Letter sound graphophonemic knowledge	9.38	9.38 (1.41)	9.67*	9.69 (1.09)
Listening comprehension	3.26	3.27 (1.77)	2.97	2.97 (1.58)

Note. Covariate appearing in the model is English language learner status.
*p<.05

First Grade

Each cohort was administered the Texas Primary Reading Inventory in September of first grade. A one-way MANCOVA was conducted on the dependent variables of word reading, letter-sound graphophonemic knowledge, blending word parts and blending phonemes (phonemic awareness), reading comprehension, and words read correctly per minute (fluency). Cohort was the independent variable and English language learner status, kindergarten phonological awareness, letter name identification, and letter-sound graphophonemic knowledge were chosen as the covariates. Assumptions of homogeneity were met and the MANCOVA main effect for the combined DV was statistically significant, Wilks' Λ= .896, $F(6,148) = 2.878$, $p<.01$, η^2= .104 (See table 7 for adjusted and unadjusted group means). Further analyses revealed that the covariates, ELL status (Wilks' Λ= .910, $F(6,148) = 2.439$, $p<.05$, η^2= .09), kindergarten blending word parts (Wilks' Λ= .911, $F(6,148) = 2.397$, $p<.05$, η^2= .089), and kindergarten letter-sound graphophonemic knowledge (Wilks' Λ= .895, $F(6,148) = 2.904$, $p<.01$, η^2= .105), also significantly influenced the combined DV. Between subjects analyses were also conducted and revealed significant differences between cohorts in first grade word reading ($F(1,153) = 6.082$, $p<.05$, η^2= .038) and reading comprehension ($F(1,153) = 7.099$, $p<.01$, η^2= .044). Words read correctly per minute, letter-sound graphophonemic knowledge, blending word parts, and blending phonemes were not statistically significant.

TABLE 7
BEGINNING OF THE YEAR FIRST GRADE ADJUSTED AND UNADJUSTED GROUP MEANS FOR COHORT

	Comparison Group		Treatment Group	
Dependent variables	Adjusted *M*	Unadjusted *M* *(SD)*	Adjusted *M*	Unadjusted *M* *(SD)*
Word Reading	5.43*	5.41 (.904)	5.13	5.15 (.594)
Words read correctly per minute	32.50	32.32 (8.50)	33.94	34.11 (13.22)
Blending phonemes	3.91	3.89 (1.41)	4.09	4.12 (1.42)
Blending word parts	3.89	3.86 (.716)	3.87	3.90 (1.08)
Letter sound graphophonemic knowledge	9.34	9.31 (1.05)	9.02	9.05 (1.71)
Reading comprehension	3.52	3.52 (.833)	3.88*	3.88 (.838)

Note. Covariates appearing in the model are English language learner status, kindergarten phonological awareness, letter name identification, and letter-sound graphophonemic knowledge.
*p<.05

The Texas Primary Reading Inventory was administered to each cohort in January of first grade. However, the full screening was not administered again to all students; only students who were considered still developing were given the screening measures. All students were administered the reading comprehension and fluency measure. Therefore, reading comprehension and words read correctly per minute were the dependent measures for the middle of the year analysis. Cohort served as the

independent variable and the covariates were ELL, September reading comprehension, and September word reading. A one-way MANCOVA was conducted. Test for homogeneity of the regression slopes were not significant, however, the Box's Test was significant; indicating that homogeneity of covariance cannot be assumed. Since the Box's Test is highly sensitive to non-normality (Mertler & Vannatta, 2002), interpretation of the findings will continue using Pillai's Trace to measure significant. The main effect for cohort was statistically significant for the combined dependent variable of reading comprehension and words read correctly per minute, $F(2,152) = 13.677$, $p < 0.001$, $\eta^2 = .153$. The multivariate effect size was large. Table 8 reports the adjusted and unadjusted means. Univariate post-hoc analyses indicated that both reading comprehension ($F(1,153) = 8.479$, $p < .001$, $\eta^2 = .071$) and words read correctly per minute ($F(1,153) = 4622.09$, $p < 0.001$, $\eta^2 = .141$) were significant. Only the covariate, ELL, affected words read correctly per minute.

TABLE 8
MIDDLE OF THE YEAR FIRST GRADE ADJUSTED AND UNADJUSTED GROUP MEANS FOR COHORT

	Comparison Group		Treatment Group	
Dependent variables	Adjusted *M*	Unadjusted *M* *(SD)*	Adjusted *M*	Unadjusted *M* *(SD)*
Words read correctly per minute	40.12	40.96 (13.29)	51.34*	50.53 (17.08)
Reading comprehension	3.55	3.58 (.876)	4.04*	4.01 (.893)

Note. Covariates appearing in the model are English language learner, beginning of year reading comprehension, and beginning of year word reading.
*p<.05

The TPRI and the ITBS were administered to the cohorts at the end of first grade. A one-way MANCOVA was conducted using TPRI word reading, words read correctly per minute, reading comprehension, ITBS vocabulary, reading comprehension, word analysis, listening comprehension, and spelling as the dependent variables. Cohort membership was the independent variable and ELL status, middle of year words read correctly per minute, and reading comprehension were the covariates. The assumptions of MANCOVA were met and the main effect for cohort on the combined dependent variable was statistically significant, Wilks' $\Lambda = .847$, $F(8,144) = 2.789$, $p<.01$, $\eta^2 = .153$. The covariate, words read correctly per minute, was also significant (Wilks' $\Lambda = .583$, $F(8,144) = 11.107$, $p< .001$, $\eta^2 = .417$). Between subjects analysis revealed statistically significant results for TPRI word reading ($F(1,151) = 7.616$, $p<.01$, $\eta^2 = .055$), reading

comprehension ($F(1,151) = 6.141$, $p<.05$, $\eta^2= .045$), and words read correctly per minute ($F(1,151) = 6.920$, $p<.01$, $\eta^2= .050$). The dependent variables from the ITBS were not statistically significant. Table 9 presents the adjusted and unadjusted means for the dependent variables.

TABLE 9
END OF THE YEAR FIRST GRADE ADJUSTED AND UNADJUSTED GROUP MEANS FOR COHORT

	Comparison Group		Treatment Group	
Dependent variables	Adjusted *M*	Unadjusted *M* *(SD)*	Adjusted *M*	Unadjusted *M* *(SD)*
TPRI				
Word Reading	5.57	5.41 (2.16)	6.32*	6.49 (1.31)
Words read correctly per minute	52.27	49.78 (16.53)	59.65*	62.21 (24.97)
Reading comprehension	4.03	3.99 (.899)	4.36*	4.40 (.719)
ITBS				
Vocabulary	143.38	141.87 (14.05)	147.19	148.75 (14.98)
Reading comprehension	150.32	149.01 (21.24)	149.852	151.19 (11.15)
Word Analysis	150.63	149.22 (16.34)	155.50	156.96 (16.63)
Listening Comprehension	148.40	147.62 (12.91)	149.64	156.96 (12.06)
Spelling	150.57	149.70 (9.08)	151.48	152.37 (9.48)

Note. Covariates appearing in the model are English language learner status, middle of year words read correctly per minute, and middle of year reading comprehension.
*p<.05

Regression

Hierarchical linear regression (also called sequential regression) was employed to determine which measures of literacy achievement statistically improved the prediction of end of year first grade reading comprehension, word reading, and fluency.

Thirteen kindergarten and first grade measures were used as predictor variables and end of year ITBS reading comprehension served as the dependent variable. Table 10 displays the unstandardized regression coefficients (B), standardized regression coefficients (β), and R, R^2, and adjusted R^2 after entry of all 13 predictor variables. With all variables in the equation, the overall model was not significant, $R^2 = .515$, $F(13, 32) = 1.503$, $p > .05$. See Appendix C for each model in the regression.

Regression analyses were also conducted using end of year TPRI word reading as the dependent variable. The unstandardized regression coefficients (B), standardized regression coefficients (β), and R, R^2, and adjusted R^2 after entry of all 13 predictor variables are displayed in table 11. The overall equation with all variables in the model was significant, $R^2 = .69$, $F(13, 32) = 3.256$, $p < .01$. The adjusted R^2 value indicates that 47.8% of the variance in end of the year first grade word reading is predicted by the 13 predictor variables in the model. Appendix D reports the findings of the individual regression models.

In the final regression analyses, end of the year TPRI words read correctly per minute was used as the dependent variable to determine the extent in which the 13 predictor variables contributed to first grade fluency. Table 12 presents the unstandardized regression coefficients (B), standardized regression coefficients (β), and

TABLE 10
OVERALL REGRESSION OF PREDICTOR VARIABLES ON END OF YEAR FIRST GRADE ITBS READING COMPREHENSION

Source	*B*	*β*	*R*	R^2	Adjusted R^2
Constant	70.829				
First BOY letter sound graphophonemic knowledge	.318	.020	.059	.003	-.071
First MOY reading comprehension	-1.660	-.131	.070	.005	-.069
Kindergarten EOY listening comprehension	1.217	.139	.071	.005	-.069
First BOY reading comprehension	-2.486	-.216	.074	.005	-.069
First BOY blending word parts	.376	.029	.080	.006	-.067
Kindergarten EOY rhyming	-2.042	-.135	.143	.020	-.052
First MOY words read correctly per minute	-.134	-.212	.329	.108	.042
Kindergarten EOY letter name identification	2.053	.192	.339	.115	.049
First BOY blending phonemes	-.734	-.087	.381	.145	.082
Kindergarten EOY letter sound graphophonemic knowledge	2.730	.171	.392	.154	.091
Kindergarten EOY blending word parts	1.86	.211	.467	.218	.160
First BOY word reading	3.952	.409	.526	.277	.169
First BOY words read correctly per minute	.387	.501	.569	.324	.274

Note. See Appendix C for hierarchical linear regression of each predictor model on EOY reading comprehension. BOY = beginning of year, MOY = Middle of year, EOY = End of year.

TABLE 11
OVERALL REGRESSION OF PREDICTOR VARIABLES ON END OF YEAR FIRST GRADE TPRI WORD READING

Source	*B*	*β*	*R*	R^2	Adjusted R^2
Constant	5.271				
First BOY blending word parts	-.332	-.168	-.032	.001	-.073
First BOY reading comprehension	-.558	-.318	-.034	.001	-.073
Kindergarten EOY listening comprehension	-.052	-.039	.061	.004	-.069
First BOY letter sound graphophonemic knowledge	-.078	-.032	.087	.008	-.065
Kindergarten EOY letter name identification	-.500	-.308	.175	.031	-.041
First MOY reading comprehension	.400	.207	.180	.032	-.039
Kindergarten EOY rhyming	.542	.236	.276	.076	.008
First BOY word reading	-.336	-.229	.344	.118	.052
First MOY words read correctly per minute	.000	.003	.479	.229	.172
Kindergarten EOY blending word parts	.257	.192	.493	.243	.187
First BOY words read correctly per minute	.056	.476	.495	.245	.189
Kindergarten EOY letter sound graphophonemic knowledge	.937	.385	.518	.268	.214
First BOY blending phonemes	.428	.335	.531	.282	.229

Note. See Appendix D for hierarchical linear regression of each predictor model on EOY word reading. BOY = beginning of year, MOY = Middle of year, EOY = End of year.

TABLE 12
OVERALL REGRESSION OF PREDICTOR VARIABLES ON END OF YEAR FIRST GRADE TPRI WORDS READ CORRECTLY PER MINUTE

Source	*B*	*β*	*R*	R^2	Adjusted R^2
Constant	60.267				
First BOY blending word parts	-8.030	-.356	-.096	.009	-.060
First BOY letter sound graphophonemic knowledge	-.950	-.034	.009	.0001	-.074
First BOY reading comprehension	-5.072	-.254	.065	.004	-.070
Kindergarten EOY letter name identification	.344	.019	.070	.005	-.070
Kindergarten EOY rhyming	4.230	.162	.131	.017	.101
Kindergarten EOY listening comprehension	-.402	-.026	.178	.032	-.040
Kindergarten EOY letter sound graphophonemic knowledge	-4.009	-.145	.200	.040	-.031
Kindergarten EOY blending word parts	4.251	.278	.312	.100	.034
First MOY reading comprehension	3.507	.160	.441	.194	.135
First BOY blending phonemes	2.083	.143	.476	.230	.173
First BOY word reading	6.468	.387	.655	.430	.390
First MOY words read correctly per minute	.371	.339	.660	.436	.393
First BOY words read correctly per minute	.091	.068	.676	.456	.416

Note. See Appendix E for hierarchical linear regression of each predictor model on EOY words read correctly per minute. BOY = beginning of year, MOY = Middle of year, EOY = End of year.

R, R^2, and adjusted R^2 after entry of all predictor variables. The overall model was significant, $R^2 = .76$, $F(13, 32) = 4.498$, $p < .01$. The adjusted R^2 value for the model indicates that 58.7% of the variance in end of the year first grade fluency is predicted by the 13 predictor variables in the model (See Appendix E).

Reliability

For kindergarten, the estimated reliability coefficient for all subtests of the TPRI was .818. Although, the overall estimated reliability was high, only one subtest, blending word parts, met the standard of .70. The remaining subtests' reliability coefficients were in the moderate range. The rhyming and listening comprehension subtests were close to the standard. The letter name identification and letter sound graphophonemic knowledge subtests were lower than the acceptable standard. See table 13 for kindergarten reliability coefficients. These findings are not surprising as they are consistent with the reliability measurement reported by TPRI (Texas Education Agency, 2002).

TABLE 13
ESTIMATED RELIABILITY COEFFICIENTS FOR KINDERGARTEN TPRI

	Cronbach's Alpha
All subtests	.818
Blending word parts	.728
Rhyming	.688
Letter name identification	.635
Letter sound graphophonemic knowledge	.649
Listening comprehension	.683

First grade reliability of the TPRI was also measured. The overall estimated reliability coefficient for the subtests was moderate and did not meet the standard of .70. Only one subtest, words read correctly per minute, met the standard of reliability. The reliability for subtest of word reading was moderate, where as the reading comprehension subtest was low (see table 14). Once again, these findings are consistent with the coefficients reported for the TPRI (Texas Education Agency, 2002).

TABLE 14
ESTIMATED RELIABILITY COEFFICIENTS FOR FIRST GRADE TPRI

	Cronbach's Alpha
All subtests	.564
Word reading	.583
Words read correctly per minute	.781
Reading comprehension	.461

In contrast to the TPRI, the overall estimated reliability coefficient for the ITBS was above the acceptable standard at .820. Individual reliabilities for the subtests of the ITBS are presented in table 15. The reliability reported for the individual subtests were within the acceptable standard of .70 and are similar to the reliability reported by the Iowa Test of Basic Skills, level 6 (ITBS, Hoover et al., 2001).

TABLE 15
ESTIMATED RELIABILITY COEFFICIENTS FOR FIRST GRADE ITBS

	Cronbach's Alpha
All subtests	.820
Vocabulary	.803
Comprehension	.770
Word Analysis	.839
Listening Comprehension	.842
Spelling	.799

Summary

This chapter reported the results of the data analyses for the present study. The MANCOVA findings indicated statistical significance between the cohorts at the end of kindergarten and first grade. Cohort 2 outperformed Cohort 1 on measures of blending word parts, letter-name identification, and letter-sound graphophonemic knowledge at the end of kindergarten on the TPRI measures. Similar statistical significance was found on TPRI measures for first grade beginning and middle of year words read correctly per minute and reading comprehension. At end of first grade, Cohort 2 outperformed Cohort 1 on measures of word reading, words read correctly per minute and reading

comprehension on the TPRI measures, however, on the more reliable and valid measures of the ITBS, there were no statistical differences found. Hierarchical regression was also utilized to find the amount of variance in reading comprehension, word reading, and fluency predicted by the measured variables at the end of first grade. Finally, reliability analyses were conducted to determine that the scores used in the data analyses were reliable and could be adequately interpreted.

CHAPTER V

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

The present study investigated whether teacher-implemented, systematic, explicit instruction in phonological awareness, letter naming, and alphabetic principle affected kindergarten and first grade literacy achievement. The study examined scores on the kindergarten TPRI, first grade TPRI, and first grade ITBS to determine differences between Cohort 1, who served as the comparison group, and Cohort 2, who served as the treatment group. Cohort 1 received literacy instruction in kindergarten and first grade using only the state adopted basal reading series. Cohort 2 received instruction in kindergarten and first grade using the state adopted basal reading series and an additional program designed on the principles of scientifically based reading research (Reading Readiness in kindergarten and Language Enrichment in first grade). Three research questions were asked:

1. Is there a statistically significant difference in the literacy achievement at the end of kindergarten for students who received systematic, explicit instruction in phonological awareness, letter naming, and letter sound correspondences than those who do not?
2. If there is a statistically significant difference between the groups at the end of kindergarten, does the difference between the groups become greater with further systematic instruction in first grade?
3. How are these students different at the end of year 1 and year 2 in terms of:
    a. Phonological Awareness

b. Word reading

c. Letter knowledge

d. Letter-sound correspondence

e. Listening comprehension

f. Reading comprehension

g. Fluency

This chapter presents the results and major findings of the present study, which are discussed in relation to the research questions, previous research findings, and the conclusions for each finding. The three major findings discussed are: 1) the effect of systematic explicit literacy instruction in kindergarten and first grade; 2) evidence for the long term growth in literacy achievement resulting from systematic explicit instruction in the early grades; and 3) the predictive value of the measures on literacy outcomes. Recommendations for further research and implications for practice are also included.

The Effect of Systematic Explicit Literacy Instruction in Kindergarten and First Grade

Research question 1 focused on determining whether the cohorts were statistically different at the end of kindergarten. Because there was no significant difference between the groups prior to treatment implementation, it can be assumed that any differences found after are likely to be caused by the treatment implementation. The instruction implemented in this study with Cohort 2 resulted in statistically significant differences between the cohorts at the end of kindergarten on the combined TPRI measures. Overall, Cohort 2 outperformed Cohort 1 on all kindergarten TPRI measures

except listening comprehension. Specifically, Cohort 2 performed better than Cohort 1 on phonological awareness at the end of kindergarten based on the blending word parts subtest of the TPRI, which was the most reliable of the kindergarten TPRI measures.

Phonological awareness has been repeatedly shown to be a strong predictor of reading achievement (Adams, 1990; Blachman, 1991; Bradley & Bryant, 1983, 1985; Ehri, 1991; Juel, 1988; Lundberg, Olofsson, & Wall, 1980; Stanovich, 1992; Stanovich, Feeman, & Cunningham, 1983; Torgesen, Wagner, & Rashotte, 1994; Wagner, Torgesen, & Rashotte, 1994). The present study showed that kindergarten students who receive instruction in phonological awareness were able to successfully blend word parts (blending of onset and rime and phonemic awareness) at the end of kindergarten. Therefore, kindergarten phonological awareness was greatly influenced by the type of instruction received. The systematic, explicit instruction used with Cohort 2 significantly improved students ability in phonological awareness at the end of kindergarten, indicating that phonological awareness can be taught. This result reiterates the findings of numerous research studies that phonological awareness can be taught (Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1991; Lundberg, Frost, & Petersen, 1988; NRP, 2000; O'Connor, Jenkins, Leicester, & Slocum, 1993).

On first grade measures, a substantial finding was that Cohort 2 outperformed Cohort 1 on TPRI measures of fluency. There were statistically significant differences between the cohorts on middle of the year words read correctly per minute, which was the most reliable measure of the first grade TPRI. Similar results were found on end of the year fluency as measured by the TPRI words read correctly per minute subtest.

Cohort 2 read more words correctly per minute than Cohort 1. Cohort 2 achieved higher levels of fluency during first grade; however, the extent to which Cohort 2's word reading and comprehension skills contributed to this difference remains unclear. On the end of year first grade standardized measures of the ITBS, there were no statistically significant differences between the groups.

Overall, by the end of first grade, there were no statistically significant differences between the cohorts on the most reliable measures of the ITBS vocabulary, reading comprehension, word analysis, listening comprehension, and spelling. The low reliability of the TPRI made interpretation of the findings for many of the measures difficult. In spite of the low reliability of the TPRI scores, the findings indicated that systematic explicit instruction in kindergarten and first grade improves kindergarten phonological awareness and first grade fluency. In general, Cohort 2, who received systematic, explicit instruction in kindergarten and first grade, outperformed Cohort 1 on all measures at the end of first grade, although some measures did not reach statistical significance.

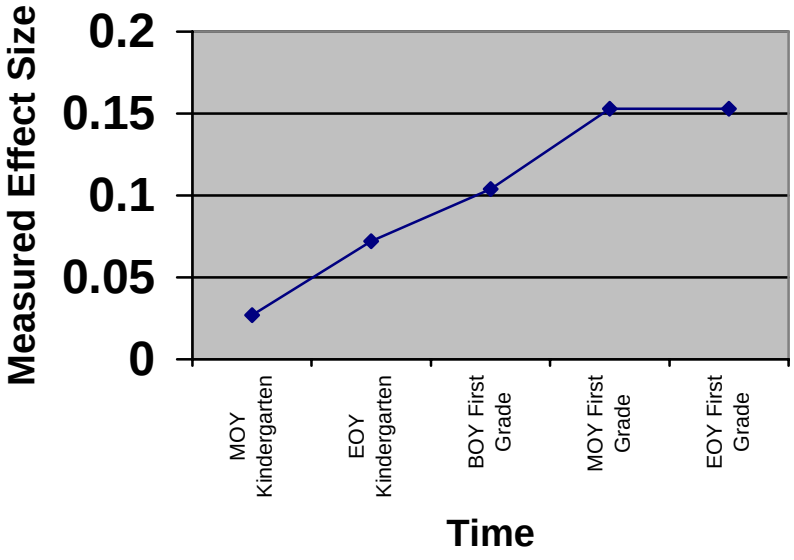
Evidence for Long Term Growth in Literacy Achievement

Research question 2 focused on whether the differences found between the groups became greater over time. There is evidence for long term growth in literacy achievement as measured by the combination of subtests on the kindergarten TPRI, first grade TPRI, and first grade end of the year TPRI and ITBS. These differences were determined by evaluating the changes in effect size for the combined dependent variable at kindergarten middle of the year, kindergarten end of the year, first grade beginning of

the year, first grade middle of the year, and first grade end of the year. The effect of cohort on the combined dependent variable (all TPRI measures taken together) at middle of year kindergarten was small and non-significant. However, after implementation of the treatment, statistically significant differences between the groups were seen and the effect sizes (or effects of the treatment) grew. The eta square reported at the end of the year kindergarten on the combined TPRI measures was .072, which is moderate in size. At beginning of the year first grade, the effect size for the combined DV (all TPRI measures) increased to .104. Middle of the year first grade showed a combined effect size for TPRI fluency and reading comprehension of .153. The effect size for the combined dependent variable of TPRI measures and ITBS measures remained the same for end of year first grade (See figure 1).

Changes in effect size indicated that differences between the cohorts after kindergarten continued to grow with additional explicit systematic instruction in first grade. However, because the growth seemed to reach a plateau at middle of first grade, further research is needed to determine if the growth trend would continue. Previous research (Bond & Dykstra, 1967) indicated that the growth seen in the present study is likely to level off after first grade.

Figure 1. Changes in Effect Size for the Combined Dependent Variable



Predictive Value of the Measures on Literacy Outcomes

This study examined whether systematic, explicit instruction in kindergarten and first grade contributed to the prediction of end of year first grade reading comprehension, word reading, and fluency. However, due to the low reliability of the TPRI word reading subtest, interpretation of the word reading regression will not be presented here.

Overall, the measured variables did not significantly contribute to end of first grade ITBS reading comprehension. The combined measures only contributed to 32% of

ITBS reading comprehension, indicating that other factors not measured here are part of reading comprehension ability. See the table reported in Appendix C.

For end of the first grade fluency, all variables accounted for over 50% of TPRI fluency. Kindergarten variables had little predictive value for first grade fluency, providing only 16.2% of the variance. However, first grade beginning of year word reading and middle of year words read correctly per minute contributed most to the variance. These findings are not surprising considering that the variables measured and the treatment implemented was more focused on improving word reading ability. The table in Appendix E details these results.

The present study also found that explicit instruction in phonological awareness and letter sound correspondences are vital to kindergarten literacy achievement and overall development word reading ability. Furthermore, development of word reading ability is necessary for development of fluency in first grade. For Cohort 2, word recognition skills played a role in developing fluent reading (Hudson, Lane, & Pullen, 2005; NICHD, 2000). Although the findings reported in this study found that kindergarten literacy achievement had little influence on fluency development, it can be inferred that the effects of kindergarten literacy achievement on word reading ability is likely to increase first grade fluency.

Recommendations

Several recommendations for further research can be determined from this study. First, it would be beneficial to continue to follow the cohorts for a longer period of time, to determine whether the treatment continues to affect literacy achievement as students

mature. Secondly, use of more reliable, standardized measures would improve the value of the present research. The low reliability of the subtests for the TPRI subtests confounded interpretation of these research results. Random selection of the sample would allow for more generalizability of results. Additionally, consistency between the subtests measured at each interval would allow better generalizability of this study's findings. Finally, follow up research to determine the effects of the treatment on students at-risk for reading disability could strengthen the case for early intervention using research based systematic, explicit instruction.

Recommendations from this study can also be used to inform practice. Based on the increase seen for Cohort 2 in phonological awareness and fluency, highly systematic, explicit instruction in phonological awareness, letter naming, and letter-sound correspondences should be used in addition to the adopted basal reading series at the kindergarten and first grade levels. Secondly, the growth in effect sizes over time indicated that instruction, similar to what was used in the present study, should be implemented beyond kindergarten, since there is evidence for long term growth due to explicit instruction in the first grade. Because the present study supported the use of systematic, explicit instruction to increase fluency, first grade students need continued reading instruction using synthetic phonics along with fluency practice and reading comprehension strategies. Additionally, teachers must receive ongoing support from curriculum designers, in-service providers, and school administration if any long term gains from explicit instruction are to be seen.

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APPENDIX A

COMPARISON OF SKILLS TAUGHT

	Reading Readiness	Basal Series Kindergarten	Language Enrichment Year 1	Basal Series First Grade
Letter naming, recognition, and Sequencing				
Matching letters	*	*		*
Introduction of individual letters	*	*		
Counting and matching letters	*			
Discuss different types of letters (vowels and consonants)	*			
Singing of alphabet songs	*	*		
Sequencing of letters	*		*	
Rapid naming of uppercase letters	*		*	
Rapid naming of lower case letters	*		*	
Before and after sequencing of letters	*			
Random identification of individual letters	*		*	
Phonological Awareness				
Rhyming	*	*	*	*
Alliteration	*	*	*	
Sentence segmentation	*	*	*	
Onset and rime segmentation	*		*	
Syllable segmentation	*	*	*	
Syllable deletion	*		*	
Onset/rime deletion	*		*	
Initial sound segmentation	*	*	*	
Final sound segmentation	*	*	*	
Initial sound deletion	*		*	*

	Reading Readiness	Basal Series Kindergarten	Language Enrichment Year 1	Basal Series First Grade
Final sound deletion	*		*	*
Medial vowel isolation	*		*	
Manipulation of initial sound	*		*	
Manipulation of final sound	*		*	
Manipulation of medial sound	*		*	
Blending of two phonemes	*	*	*	*
Blending of three phonemes	*	*	*	*
Blending of four+ phonemes	*		*	
Segmentation of two phonemes	*	*	*	*
Segmentation of three phonemes	*	*	*	*
Segmentation of four+ phonemes	*		*	
Alphabetic Principle				
Introduction of clipped consonant sounds	*	*	*	*
Introduction of continuant consonant sounds	*	*	*	*
Introduction of short vowel sounds	*	*	*	*
Introduction of consonant blends			*	*
Introduction of consonant digraphs			*	*
Incorporation of decodable texts	*	*	*	*
Introduction of long vowels			*	*
Introduction of long vowel consonant e pattern			*	*
Introduction of vowel pairs			*	*

	Reading Readiness	Basal Series Kindergarten	Language Enrichment Year 1	Basal Series First Grade
Introduction of diphthongs				
Introduction of R-controlled vowels			*	*
Introduction of final stable syllable patterns			*	
Strategies for blending and decoding one syllable words	*	*	*	*
Strategies for blending and decoding multisyllabic words			*	
Deliberate sequencing of letter sound introduction	*		*	
Periodic review and mastery of skills	*	*	*	*
Repeated practice of reading decodable words	*	*	*	*
Introduction and reading of sight words		*	*	*
Reading for fluency			*	*
Matching letters to sounds	*	*	*	*
Introduction of word parts (prefixes, suffixes, roots)			*	*

APPENDIX B

OBSERVATION FOR READING READINESS

Teacher and School:

Date:

Observer:

Key:

*Initial Daily Schedule:
*1. Letter Recognition
*2. Phonological Awareness
*5. Oral Language

Scale: Low: 1-----High: 5

*1. Letter Recognition Activity number:_____ Start time:_____

Activity is implemented with fidelity	1	2	3	4	5
Teacher monitors student performance	1	2	3	4	5
Activity completed in a timely fashion	1	2	3	4	5

Comments:

*2. Phonological Awareness Page number: _____ Start time:_____

Teacher explains and models activity	1	2	3	4	5
Students echo and complete activity	1	2	3	4	5
Corrections are made by remodeling	1	2	3	4	5
Activity completed in a timely fashion	1	2	3	4	5

Comments:

3. Multisensory Letter Introduction Letter:_____ Start time:_____

Review of Reading Deck Card(s) (Students name letter, key word, and sound)	1	2	3	4	5
Activity is implemented with fidelity	1	2	3	4	5

Use of Procedure 1 or 2 for Word Practice	1	2	3	4	5
Activity completed in a timely fashion	1	2	3	4	5

Comments:

4. Handwriting Letter:_____ Start time:_____

Organization of material	1	2	3	4	5
Engagement of students	1	2	3	4	5
Activity completed in a timely fashion	1	2	3	4	5

Comments:

*5. Oral Language Unit_____ Start time _____

Check one activity: Naming ___ More naming ____ Describing ___
Things to think about ___ Critical thinking ___

Teacher elicits and Scaffolds student responses	1	2	3	4	5
Organization of materials	1	2	3	4	5
Activity completed in a timely fashion	1	2	3	4	5

Comments: End time _____

General Comments of lesson:

Demonstration Checklist for Language Enrichment

Time

_____ 1. Reading Decks

Review of IRD, Word part deck 1 2 3 4 5
(Students name letter, key word, and sound)

Activity is implemented with fidelity 1 2 3 4 5
Comments:

_____ 2. New Concept lesson_____

Comments:

_____ 3. Reading Practice page_____

Activity is implemented with fidelity 1 2 3 4 5

Teacher monitors student performance 1 2 3 4 5

Activity completed in a timely fashion 1 2 3 4 5
Comments:

_____ 4. Review

Comments:

_____ 5. Oral language and Comprehension

Teacher elicits and
Scaffolds student responses 1 2 3 4 5

Organization of materials 1 2 3 4 5

Activity completed in a timely fashion	1	2	3	4	5

Comments:

_____ 6. Listening comprehension

Organization of material	1	2	3	4	5
Engagement of students	1	2	3	4	5
Activity completed in a timely fashion	1	2	3	4	5

Comments:

General Comments:

APPENDIX C

HIERARCHICAL LINEAR REGRESSION FOR ITBS READING COMPREHENSION

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
1	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS	.467	.218	.193	.006**	.218	8.644	.006
2	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS	.470	.221	.169	.024*	.002	.095	.761
3	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION	.476	.227	.147	.056	.006	.227	.637
4	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE	.481	.231	.121	.107	.004	.162	.690
5	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION	.488	.238	.097	.171	.007	.256	.617

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
6	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE	.492	.242	.067	.258	.004	.135	.717
7	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING	.710	.504	.365	.008**	.262	13.184	.001
8	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS	.715	.512	.349	.014*	.008	.378	.545

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
9	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS	.717	.515	.325	.026*	.003	.153	.699
10	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE	.730	.532	.320	.035*	.017	.821	.375

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
11	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION	.747	.558	.326	.04*	.025	1.201	.286
12	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION, FIRST TIME 2 WORDS CORRECT PER MINUTE	.768	.590	.344	.04*	.033	1.593	.221

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
13	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION, FIRST TIME 2 WORDS CORRECT PER MINUTE, FIRST TIME 2 READING COMPREHENSION	.772	.596	.320	.062	.006	.299	.591

Note. Dependent variable = reading comprehension; *p<.05, **p<.01

APPENDIX D

HIERARCHICAL LINEAR REGRESSION FOR TPRI WORD READING

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
1	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS	.493	.243	.219	.004**	.234	9.971	.004
2	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS	.525	.276	.227	.008**	.032	1.331	.258
3	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION	.546	.298	.225	.015*	.022	.912	.347
4	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE	.634	.402	.317	.005**	.105	4.900	.035

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
5	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION	.637	.406	.296	.011*	.004	.186	.670
6	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE	.638	.407	.270	.024*	.000	.011	.916

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
7	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING	.684	.468	.319	.016*	.061	2.873	.103
8	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS	.712	.507	.343	.015*	.039	1.920	.179

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
9	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS	.739	.546	.368	.014*	.039	1.962	.175

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
10	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE	.780	.608	.429	.008**	.062	3.468	.076

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
11	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION	.817	.667	.493	.004**	.059	3.737	.067

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
12	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION, FIRST TIME 2 WORDS CORRECT PER MINUTE	.821	.674	479	.007**	.007	.448	.511

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
13	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION, FIRST TIME 2 WORDS CORRECT PER MINUTE, FIRST TIME 2 READING COMPREHENSION	.831	.690	.320	.01**	.016	.977	.335

Note. Dependent variable = reading comprehension; *p<.05, **p<.01

APPENDIX E

HIERARCHICAL LINEAR REGRESSION FOR TPRI FLUENCY

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
1	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS	.312	.098	.068	.077	.098	3.351	.077
2	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS	.320	.102	.042	.198	.005	.159	.693
3	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION	.350	.123	.032	.277	.020	.676	.418
4	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE	.353	.124	-.001	.427	.002	.051	.823
5	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION	.401	.161	.005	.418	.036	1.170	.289

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
6	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE	.402	.162	-.032	.553	.001	.034	.856
7	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING	.716	.512	.376	.007**	.351	17.982	.001**
8	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS	.719	.517	.356	.013*	.004	.207	.653

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
9	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS	.768	.590	.430	.006**	.073	7.121	.054
10	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE	.788	.622	.450	.006**	.032	1.838	.189

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
11	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION	.820	.673	.502	.003	.051	3.306	.083
12	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION, FIRST TIME 2 WORDS CORRECT PER MINUTE	.863	.745	.592	.001**	.072	5.666	.027

Model	Source(s)	R	R Square	Adjusted R Square	Sig.	Change Statistics		
						R Square Change	F Change	Sig. F Change
13	KINDER TIME 2 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, KINDER TIME 2 RHYMING PHONOLOGICAL AWARENESS, KINDER TIME 2 LETTER NAME IDENTIFICATION, KINDER TIME 2 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, KINDER TIME 2 LISTENING COMPREHENSION, FIRST TIME 1 LETTER SOUND GRAPHOPHONEMIC KNOWLEDGE, FIRST TIME 1 WORD READING, FIRST TIME 1 BLENDING PHONEMES PHONOLOGICAL AWARENESS, FIRST TIME 1 BLENDING WORD PARTS PHONOLOGICAL AWARENESS, FIRST TIME 1 WORDS CORRECT PER MINUTE, FIRST TIME 1 READING COMPREHENSION, FIRST TIME 2 WORDS CORRECT PER MINUTE, FIRST TIME 2 READING COMPREHENSION	.869	.755	.587	.002**	.009	.732	.403

Note. Dependent variable = reading comprehension; *p<.05, **p<.01

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Publications:

Carter, T.A., & Dean, E.O**.** (2006). Mathematics intervention for grades 5-11: Teaching mathematics, reading, or both? *Reading Psychology, 27*, 127-146.

Aaron, P.G., Joshi, R.M., & Ocker, E.S. (2005). Summoning up the spirits from the vast deep: LD and giftedness in historic persons. In T.A. Newman & R.J. Sternberg (Eds.), *Students with both gifts and learning disabilities* (pp. 199 - 234). Boston: Kluwer.

Research Interests: Teacher knowledge of reading instruction, Systematic reading instruction, Diagnosis and remediation of reading difficulties