THE EFFECTS OF MULTISENSORY, EXPLICIT, AND SYSTEMATIC INSTRUCTIONAL PRACTICES ON ELEMENTARY SCHOOL STUDENTS WITH LEARNING IMPAIRMENTS IN ENCODING AND ORAL READING

A thesis presented
by
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to
The School of Education

In partial fulfillment of the requirements for the degree of
Doctor of Education

in the field of
Education

College of Professional Studies
Northeastern University
Boston, Massachusetts
February 2015
Abstract

As national education standards have increased in rigor over the past decade following the passage of the No Child Left Behind Act (2001) and the Common Core State Standards (2010), heightened demands are critical for students who exhibit learning deficits in literacy using research-based programs and approaches. The problem under examination in this research study is the effect that multisensory, systematic, and explicit instructional practices have upon student achievement through a quantitative, single-subject study on three students’ encoding and oral reading skills who exhibit learning impairments. In this study, a visual analysis method was employed to measure academic learning outcomes in reading and encoding. Using the Word Identification and Spelling Test (WIST) and Comprehensive Test of Phonological Processing (CTOPP-2), results demonstrated favorable outcomes with increased scores in encoding and oral reading skills. Scores were noted to be more significant in oral reading than spelling. The graphic data depicted in this research analysis also provides substantial documentation for the phonological deficit theory. Furthermore, replication of the instructional practices utilized in this study can potentially increase academic growth within spelling and reading skill development as well as allow students with learning impairments to acquire the foundational literacy skills required to access higher level content-based curricula across additional academic disciplines. Moreover, these findings confirm the significance of incorporating a multisensory, explicit, and systematic approach that involves high-leveraged strategies and skills needed for student achievement.

Keywords: instructional practices, encoding, oral reading, learning impairments, multisensory, explicit, systematic
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Chapter 1: Introduction

Statement of the Problem

Data from the National Center for Learning Disabilities showed that, in 2014, 2.4 million American students were diagnosed with one or more learning disabilities and received special education services (Cortiella & Horowitz, 2014). This statistic translated to approximately 1 in 10 children throughout the nation possessing some type of learning disability. A learning disability is lifelong and cannot be treated through medication or be outgrown (National Center for Learning Disabilities, 2015). According to the Individuals with Disabilities Education Act (IDEA, 2004), a learning disability is:

A disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think speak, read, write, spell, or do mathematical calculations. (para. 1)

A learning disability may detrimentally impact student success in school and future career opportunities once students transition into adulthood (Ainscow, Booth, & Dyson, 2013; NCLD, 2015; Obiakor, Harris, Mutua, Rotatori, & Algozzine, 2012. Results from a national report on the State of Learning Disabilities (NCLD; 2014) concluded that secondary students identified as having learning disabilities were performing significantly below their peer counterparts in overall academic achievement. Furthermore, research showed that, on average, 19% of students with diagnosed learning disabilities drop out of high school, a significantly higher percentage than the general education population who drop out of secondary education yearly (Cortiella & Horowitz, 2014).
Since 1975, with the Education for All Handicapped Children Act, now known as IDEA, children with disabilities have access to a “free appropriate public education” (IDEA, 2004, para. 2) in the “least restrictive environment” (IDEA, 2004, para. 1). Oftentimes the “least restrictive environment” is mainstreaming or inclusion of students with disabilities into the traditional classroom (IDEA, 2004, para. 1). The percentage of mainstreamed students has increased substantially since the reauthorization of IDEA in 2004. In 1988-1999, approximately 31% of students with disabilities spent over 80% of their time in a traditional classroom (American Youth Policy Forum and Center on Education Policy, 2002); in 2010, 60.5% of students with a disability spent over 80% of their day in a traditional classroom (National Center for Education Statistics, n.d.).

Despite the social and educational benefits that students with disabilities have received due to mainstreaming, these children still face academic challenges in the inclusive classroom (Alquraini & Gut, 2012; McLeskey, Landers, Williamson, & Hoppey, 2012; Obiakor et al., 2012). Only 11% of students with diagnosed learning disabilities receive an adapted curriculum, which is specially designed to meet the needs of this population of learners (Cortiella, 2011). There remains a need for “effective instructional strategies that improve students’ [with disabilities] access and progress in the general education curriculum” (Alquraini & Gut, 2012, p. 54).

Significance of the Problem

Research significance. Since the beginning of the 20th century, special education scholars and educators have debated over the most effective interventions that promote and enhance reading and spelling skills, especially for children with learning disabilities (Anderson & Fenty, 2013; Griffiths & Stuart, 2013; Solis et al., 2012). In the 1990s, the American elementary educational system adopted the whole-language literacy approach, despite little research demonstrating its
efficacy (Gillam & Gillam, 2014). The whole-language paradigm, which emphasized meaning-centered reading, posited that text meaning played a more critical role than did phonemic instruction in the development of literacy skills (Gillam & Gillam, 2014; Reyhner, 2008). The whole-language approach entailed the use of an unstructured teaching sequence of skills wherein background knowledge was required for students to proficiently acquire literacy skills (Gillam & Gillam, 2014; Reyhner, 2008). Students with disabilities received little benefit from whole-language instruction, due primarily to its de-emphasis on phonics coupled with the lack of a structured approach to language instruction (Gillam & Gillam, 2014; Slavin, Lake, Chambers, Cheung, & Davis, 2009).

In contrast, multisensory language instruction that is explicit and systematic has held more promise for students with disabilities, and the International Dyslexia Association (IDA), National Institute of Child Health and Human Development (NICHHD), and the National Reading Panel (NRP) have advocated its use in the elementary classroom (Kerins, Trotter, & Schoenbrodt, 2010; McIntyre & Hulan, 2013). A strength of multisensory, explicit, and systematic language instruction is that it was developed from and guided by cognitive neuroscience research that has shown, for example, that deficits in phonology stem from limited awareness in phonology as well as deficits in short-term memory in the verbal domain (Goswami, 2008, 2013; Ramus, 2004). In turn, the instructional approaches in multisensory, explicit, and systematic teaching take into consideration the cognitive issues that are often seen in children with disabilities. For example, multisensory instruction that is explicit employs visual, auditory, tactile, and kinesthetic (VAKT) modalities presented simultaneously or sequentially (Birsh, 2005; Carreker & Birsh, 2011; McCulley, Katz, & Vaughn, 2013). With multisensory teaching, students with learning impairments retain taught skills and process information most effectively when all learning
channels are incorporated simultaneously (McIntyre & Hulan, 2013; Slavin et al., 2009).

Instructional practices that are multisensory, explicit, and systematic are extremely helpful for students with learning difficulties because they focus on a learning sequence of simple to complex and known to unknown concepts (Birsh, 2005; Carreker & Birsh, 2011; McCulley et al., 2013). Furthermore, explicit teaching allows for an academic progression from parts to whole and then whole parts into segmented instructional components - where instruction is both synthetic and analytic (Birsh, 2005; Carreker & Birsh, 2011; McCulley et al., 2013). Diagnostic measures regarding instructional approaches are implemented through utilizing assessments to inform instruction based on the individual needs of the learner through a scope and/or sequence conducive to the students’ learning needs (Birsh, 2005; Carreker & Birsh, 2011; Gillam & Gillam, 2014; McCulley et al., 2013).

**Importance of second grade.** Second grade is a crucial year for students to develop the foundational literacy skills needed to access higher-level literacy skill areas and to experience profound success across reading content areas (Lai, George Benjamin, Schwanenflugel, & Kuhn, 2014; McMaster, Espin, & Broek, 2014; Westwood, 2014). The development of oral reading and spelling skills is especially crucial in second grade (Abbott, Wills, Miller, & Kaufman, 2012; Apel, Wilson-Fowler, Brimo, & Perrin, 2012; Westwood, 2014). According to the Common Core State Standards (CCSS; 2010), fundamental skills that students are expected to acquire with mastery in second grade include concepts about print, awareness in phonology, phonics and recognizing words with fluency, all of which drive oral reading and spelling skills (Haager & Vaughn, 2013). Basic phonemic and encoding skill proficiency are rudimentary elements that second-grade students need to acquire prior to students’ transition to third grade (Apel et al., 2012; Haager & Vaughn, 2013; Wanzek et al., 2013).
Oral reading literacy skill development is particularly important for second-grade students with reading disabilities, as they not only achieve less but “have consistently lower reading rates” than general education second-grade students in developing oral reading and spelling skills (Wang, Algozzine, Ma, & Porfeli, 2011, p. 443). Considering that students with identified learning disorders perform below grade level and develop literacy skills at a slower rate than general education students, the development of CCSS second grade literacy skills is vital prior to third grade (Anderson & Fenty, 2013; Haager & Vaughn, 2013; Wanzek et al., 2013). In third grade, the CCSS reading curriculum shifts from learning segmented components of phonemes and word analysis skills to rigorous application of phonics and word recognition skills (Anderson & Fenty, 2013; Haager & Vaughn, 2013). Shaywitz (2003), Wanzek et al. (2013), and Westwood (2014) contended that it is possible to provide effective student support after second grade, although it is harder since there is a major transition to reading for meaning in third grade rather than teaching phonemic components of words.

**Theoretical significance.** Reading interventions, such as the whole-language approach, failed to consider the unique cognitive and neuropsychological aspects of students with learning disabilities (Goswami, 2008, 2013; McMaster et al., 2014). Students with impairments in learning have often experienced teaching methods that do not align with their learning abilities and needs within the areas of oral reading, encoding, and reading comprehension (McCulley et al., 2013; Seidenberg, 2013). These skills are vital for literacy development (McCulley et al., 2013; Seidenberg, 2013).

Multisensory approaches that are explicit and systematic, however, have been recognized by educational researchers, as well as national reading organizations such as IDA and NRP, as an effective intervention to develop and strengthen the reading skills of children with learning
impediments (Kerins et al., 2010; McIntyre & Hulan, 2013; Seidenberg, 2013). However, there remains limited research on the efficacy of multisensory, explicit, and systematic language instruction on the oral reading and encoding skills of second-grade students with disabilities (Griffiths & Stuart, 2013; Seidenberg, 2013). Therefore, the purpose of this study is to examine, via a single-subject experimental design, the effectiveness of the research-based practice of multisensory, explicit, and systematic language instruction on second-grade students’ oral reading and encoding skills. Specifically, the study will examine the following research question.

**Research Question and Hypothesis**

Are specialized, instructional approaches that are multisensory, explicit, and systematic effective for 2nd grade students who exhibit learning impairments?

**Research hypothesis.** Given the central research question, the hypothesis states the following: Students in grade 2 with diagnosed learning impairments in the areas of encoding and oral reading who are taught with multisensory, explicit, and systematic teaching approaches will show significant improvement in literacy within the subject areas of encoding and oral reading.

**Null hypothesis.** Based on the central research question and research hypothesis, the null hypothesis states: Multisensory, explicit, and systematic teaching instructional approaches have no effect for students who exhibit learning impairments in grade 2 across encoding and oral reading.

**Theoretical Framework**

**Phonological deficit theory.** The theory that guides this study is the phonological deficit theory (Frith, 1998; Hatcher & Snowling, 2014; Snowling & Hulme, 2012; Snowling, Nation, Moxham, Gallagher, & Frith, 1997). The phonological deficit theory is the most widely used theory on the development of reading and learning deficits, especially dyslexia (Hatcher & Snowling, 2014; Snowling & Hulme, 2012). The central tenet of this theory is that reading
disabilities such as dyslexia “arise from neurological differences in brain structure and function and affect a person’s ability to store, process or communicate information” (Cortiella, 2011, p. 3).

The phonological deficit theory posits that specific genetic-based brain differences cause deficits in phonological processes specific to oral reading (e.g., phonetic deficits) and spelling (i.e., poor phoneme-grapheme system knowledge), which in turn causes the outcomes of (a) impaired verbal short term memory, (b) limited development of reading skills and (c) poor phoneme awareness (Frith, 1998; see Figure 1). The phonological deficit theory is explained as being a causal model of biological, neurological, and cognitive phonological processes “that affects a person’s ability to represent the smallest units of speech sound (phonemes)” (Hatcher & Snowling, 1998).

![Phonological deficit theory](image-url)

The neurology and phonology components of the phonological deficit theory are discussed in the following sections.

**Phonology deficit theory: Biological-neurological level.** Reading acquisition is a very complex process that requires various structures in the brain working together to develop proficient reading skills (Hudson, High, & Otaiba, 2007). The specific areas of the brain that are involved in reading acquisition and thought to be impaired according to the phonological deficit theory include: (a) Broca’s area, in the frontal lobes of the brain; (b) the parieto-temporal region of the brain; and (c) the occipito-temporal region of the brain (Hudson et al., 2007). Broca’s area is located in the front of the brain and is responsible for articulation and word analysis skills (Shaywitz et al., 2004). The parieto-temporal region is in the back of the brain and allows decoding of words using units of individual sounds to develop word analysis skills. Lastly, the occipito-temporal is also in the back of the brain and is responsible for visual word formation (Cullingham, 2013). These particular brain structures are essential regions of focus for students in order for this population of learners to develop the skills which they require to read fluently (Shaywitz & Shaywitz, 2001). Students who exhibit disabilities in reading often utilize a “neurological detour” (Cullingham Video, 2013, 4:09) by attempting to apply rote memorization skills when reading phonemes in words rather than using a strategy to decode sounds in words.

The phonological deficit model has received support via brain imaging studies (e.g., Shaywitz, 1996; Shaywitz & Shaywitz, 2001). Functional brain imaging studies have been used to analyze brain structures of children who are unable to process the phonological features of language (Shaywitz & Shaywitz, 2001). Research has demonstrated that students who cannot process the features of phonology possess under-activation in the parieto-temporal and occipito-temporal regions of the brain and over-activation in the Broca’s region (Shaywitz & Shaywitz,
As a result, students who have difficulty acquiring reading skills fluently and accurately solely rely on the frontal regions within the brain used for articulation to compensate for the regions within the back of the brain (Shaywitz & Shaywitz, 2001). In order to activate these three reading systems within the brain properly to develop efficient reading skills, these three regions must work in conjunction with each other (Shaywitz & Shaywitz, 2001). The structures within the brain serve as a fundamental reason as to why the phonological features of the English language need to be broken down systematically and explicitly for students with learning deficits based on brain systems’ inabilities to work properly.

Figure 2. Brain structures utilized for reading. Adapted from *Overcoming dyslexia: A new and complete science-based program for reading problems at any level*, by S. E. Shaywitz, 2003, p. 78. Copyright 2003 by Alfred A. Knopf. Reprinted with permission.
Phonological deficit theory: Cognitive-phonological level. According to the phonological deficit theory, the phonological deficits are localized to sound and sound-symbol relationships (Hatcher & Snowling, 2014; Snowling & Hulme, 2012). These deficits in turn cause impairments in verbal short-term memory, poor reading acquisition, and poor phonological awareness (Frith, 1998; Hatcher & Snowling, 2014; Snowling & Hulme, 2012). Shaywitz (1996) emphasized that the large number of various phonemes across the English dialect - 44 - make it critical for students to be able to understand and apply sound-symbol relationships to facilitate the process of decoding sound structures in words. Prior to the actual pronunciation of a word, the isolated word requires phonetic units to be broken down (Cortiella, 2011; Shaywitz, 1996; Snowling & Hulme, 2012). Students with reading difficulties who make an attempt to process these words have great difficulty in understanding and applying sounds in words, poor skills in orthography (recalling patterns of letters), and difficulty segmenting words into individual units of sound (Cortiella, 2011; Hatcher & Snowling, 2014). The phonological deficit further results in impediments in oral reading and spelling skill development (Shaywitz, 1996; Snowling & Hulme, 2012).

Torgeson (1998) further asserted that the most prevalent causes of poor word retrieval skills are attributed to weaknesses in students’ abilities to process the language features of phonology. In turn, the shift from oral language to print becomes a rigorous task for students who are struggling to learn how to approach reading with mastery (Torgeson, 1998). Shaywitz and Shaywitz (2001) further maintained that “a deficit in phonology represents the most robust and specific correlate of reading disability” (p. 11). As a result, difficulties in phonological processing often conceal superior comprehension skills for students who exhibit learning disabilities and deficits, despite the levels of intelligence and the learning potential this population of students display (Shaywitz & Shaywitz, 2001).
Results in a study by Eide and Eide (2011), which examined the critical components of literacy in students who exhibit reading difficulties, reinforced the theoretical framework of the phonological deficit model. They found that the three central elements fundamental for all students were decoding, fluency, and comprehension. Students who exhibited deficits in these areas were more likely to experience significant obstacles acquiring basic reading skills - both with segmenting and discriminating individual phonemes in words. Eide and Eide (2011) argued that skills in phonology were critical to students’ reading development, as these skills provided the foundation to understanding the structure of language. As such, phonological deficits could lead to further problems in language comprehension once students progressed to higher-level reading concepts (Eide & Eide, 2011; Shaywitz, 2003; Torgeson, 1998). Hence, problems in phonology can lead to significant reading difficulties later in life (Eide & Eide, 2011; Shaywitz, 2003; Torgeson, 1998).

Phonology disorder theory in relation to multisensory, systematic, and explicit practices. The theoretical framework of the phonological deficit theory relates to the research question within this problem of practice: Are specialized, instructional approaches that are multisensory, explicit, and systematic effective for students who exhibit learning impairments in the areas of encoding and oral reading? As previously stated, the phonological deficit is the result of a reading impairment based on brain structures specific to the area of literacy (Shaywitz & Shaywitz, 2001). Shaywitz (1996) noted that research ranging from early childhood to high school students indicated that “phonological awareness was the best predictor of reading ability” (p. 101). Given that the vast majority of students who possess learning difficulties exhibit reading impairments, this particular framework is most appropriate and lays the groundwork with regard to
addressing this phonological deficit through specialized instructional methods designed to meet the needs of students with impairments in phonology.

The phonological deficit theory is parallel to multisensory instructional approaches, which are explicit, and systematic. Research demonstrates that connecting visual, auditory, and tactile learning pathways of the brain are critical in order for students to practice and retain phonological skills (Kaufman & Hook, 1996). This concept, known as multisensory instruction, is defined as “using all learning pathways in the brain (visual/auditory, kinesthetic-tactile) simultaneously in order to enhance memory and learning” (International Dyslexia Association, 2000, p. 1). Multisensory, explicit, and systematic programs provide a structure that addresses phonology, direct teaching, association of sound-symbol correspondence, and instruction through all pathways for learning (McIntyre & Pickering, 1995). Furthermore, programs that incorporate multisensory, explicit, and systematic instruction address the phonological deficit since the content taught is determined by ongoing assessments targeted to students’ learning needs and mastered at a modified pace of instruction based on the individual needs of the students (McIntyre & Pickering, 1995). This requires a skilled instructor to carry out prescribed teaching methods that are individualized and based on a thorough evaluation of the needs of students with learning difficulties (McIntyre & Pickering, 1995). Overall, this theory seeks to justify a scope and sequence of instructional methods that are critical for student achievement, and involves an explicit and systematic approach that is broken down into a design conducive to the individual characteristics of students who possess learning impairments.

**Positionality Statement**

**Researcher’s background.** The researcher of this study has worked in the field of special education upon graduation from her Master of Arts program in special education. She assumed a
minor in elementary education for her undergraduate degree prior to her graduate work in the field of special education. After working for two years with students exhibiting special needs and recognizing the impact that specially designed instructional programs had on student learning outcomes, she pursued her certification in two specialized literacy programs designed for students with learning difficulties: Orton-Gillingham (Orton-Gillingham Academy of Practitioners and Educators) and the Wilson Reading Program (Wilson Reading Academy). She furthered her knowledge of intervention programs by obtaining extensive training in the programs entitled LindaMood-Bell Phoneme Sequencing Program and Project Read (with a focus on reading and written language). She has now worked in the field of special education for over 13 years.

**Position stance of researcher.** The researcher will frame the importance of her experiences as an educator to the research topic of focus within this study by utilizing her background knowledge and experiences as an educator, practitioner, and an instructor for students who require specialized methodologies due to diagnosed learning impediments. The researcher exhibits a specific stance on how to close the achievement gap for students with learning difficulties based on her knowledge, background, and experiences. As new initiatives have arisen attributed to the urgency of closing the gap, it is now more critical than ever to change the trajectory of the population with respect to students who exhibit special needs. One of the cornerstone elements involves intervening in the primary grades through a comprehensive and cohesive instructional program designed to meet the unique needs of students who are unable to learn through conventional teaching approaches.

The problem of practice that the researcher has selected involves reforming instruction based on the national achievement gap in special education. With the current initiatives in place regarding IDEA (2004), CCSS (2010), and NCLB (2001), it is now more vital than ever for
students to develop foundational literacy skills who exhibit documented learning impediments. The researcher’s interests stem from her position as a special educator and examining how early intervention in conjunction with research-based instructional practices can extend to a national level in the field of special education. Given the implementation of specially designed instruction for students with learning difficulties, the researcher’s aim is to determine how instructional practices that target multisensory, explicit, and systematic practices can lead to successful learning outcomes. In turn, the researcher’s perspective is that with the proper instruction, students will independently be able to access additional content areas of instruction, extending to multiple subject areas. The researcher holds the belief that it is essential for students to be instructed by a highly qualified special educator, receive a substantial level and duration of direct instructional practices, and receive an intervention program that is immediate upon the diagnosis of a disability.

**Perspectives and beliefs in special education.** The researcher’s topic of study correlates effectively to the credentials she currently holds to teach reading. Carnine, Silbert, Kame’enui, and Tarver (2010) contended that teachers must be adept in several areas to teach reading successfully. These areas of expertise include the development of fundamental skills necessary within the process of teaching reading, specific instructional procedures, the sequence of how skills should be presented to students, and how to gather data to inform programs of instruction that meet students’ learning needs.

The researcher acknowledges that there are specific principles of instruction needed to close instructional gaps in student learning, particularly with students who exhibit learning problems. The three principles that she has determined that are extremely significant are multisensory, explicit, and systematic teaching procedures in an effort to address improving overall literacy achievement. These principles are rooted in the importance of directly teaching
learning concepts, instructing students through a scope and sequence that is delineated in a chronological order, and incorporating all teaching modalities to address the visual, auditory, and tactile brain pathways needed for student achievement of children with learning obstacles. Based on her experiences in the field of special education with particular respect to the elementary education population, she believes that early intervention is most critical to the success of each student. Her rationale is attributed to the level of content that students are expected to acquire once they reach the end of the third grade, extending beyond literacy to additional curricular areas across science, technology, social studies, mathematics, and written language. As a result, the researcher highlights that if foundational skills are not initially developed within the primary grades, students will experience major obstacles in sustaining achievement across further content areas.

**Addressing inherent biases.** The researcher recognizes that biases may persist within this particular problem of practice. She ascertains the teaching practices incorporated within the research field of special education should be the sole and primary methods that should be used with students consisting of this population. Her background as a special educator and learning disabilities specialist, as well as her work in the field of special needs, have influenced these potential biases. Moreover, research conducted validates her beliefs and perspectives pertaining to the efficacy of these instructional methods designed for students with learning impairments. Her biases stem from research-based instructional practices by leading experts in the field of special education.
Chapter 2: Literature Review

Chapter 2 offers an extensive review of the literature and research related to multisensory, explicit, and systematic instructional methods as well as the impact these teaching principles have upon literacy. The chapter is divided into eight sections: (a) the historical context of learning disabilities and connection to multisensory, explicit, and systematic instructional methods, (b) the ongoing national debate on implicit vs. explicit instruction, (c) recommendations generated by the NRP (2000) to examine research-based elements with regards to reading approaches that are effective, (d) correlation of the NRP to content and principles of instruction supported by multisensory skills and strategies that are explicit and systematic, (e) relevance of quality and delivery to research-based multisensory, explicit, and systematic programs, (f) empirical studies that support specialized reading approaches and central themes attributed to findings, (g) gaps in literature, and (h) summary of recommendations based on theories and research relevant to multisensory, explicit, and systematic instructional practices.

Historical Context of Instructional Methods to Students With Learning Difficulties

The historical roots of learning disabilities and the instructional methods used to address them originated in the late 19th century. Adolph Kussmaul (1877), a German physician, pioneered the term “word blindness,” a condition that he attributed to the lack of acquiring literacy skills (as cited in Hallahan & Mercer, 2003, p. 2). He explained that in the case of word blindness, “a complete text-blindness may exist, although the power of sight, the intellect, and the powers of speech are intact” (as cited in Hallahan & Mercer, 2003, p. 2). This description conveyed that all underlying abilities were present in his word blind subject except the subject’s ability to retrieve words. The phrase word blindness preceded the movement to find the most effective methods that would support students with learning difficulties in the acquisition of word reading.
Shortly after Kussmaul (1877) developed the phrase word blindness, a Scottish ophthalmologist named James Hinshelwood emulated Kussmaul’s research, coining the term *congenital word blindness* in 1895 to describe patients with difficulties in oral reading fluency (Hinshelwood, 1895). Hinshelwood (1917) published a study in *Lancet*, in which he asserted that the region in the brain responsible for reading did not function properly based on evidence from his findings. Additionally, Hinshelwood (1917) demonstrated that conventional teaching methods were unsuccessful when used with students with brain damage. This publication was a milestone in an effort to improve methods of teaching for students who possessed learning difficulties.

The next milestone in developing instructional methods for students with learning difficulties came when Grace Fernald and Helen Keller (1921) launched the VAKT method in the early 20th century to support students in the areas of reading and spelling. Their multisensory approach integrated visual, auditory, kinesthetic, and tactile modalities (as cited in Myers, 1978). Prior to Fernald and Keller’s (1921) approach, specific methods had not been attempted to correct learning problems. Fernald and Keller’s (1921) approach emphasized the need to focus on a kinesthetic-tactile modality in correlation with auditory and visual learning channels (as cited in Myers, 1978). This method was based on the premise that kinesthetic and tactile modalities could increase students’ understanding and knowledge of word structure and words in print. Ultimately, the *Fernald Method* was developed to increase identification of sight words, recognition of words, and knowledge of spelling rules and generalizations for students who were unable to learn through traditional teaching methods (as cited in Myers, 1978).

Samuel T. Orton (1879-1948), a neurologist, was one of the leading figures to determine the causes and treatments for learning disabilities (Academy of Orton-Gillingham, 2012). After being influenced by the methods introduced by Fernald and Keller (1921), he began his own
research into the root of reading problems by combining research on reading difficulties in conjunction with remediation principles (Academy of Orton-Gillingham, 2012). Orton’s philosophy focused on the implementation of specific teaching principles to correct reading difficulties and language processing deficits (Academy of Orton-Gillingham, 2012). These instructional methods were known as multisensory teaching strategies and involved the integration of learning channels to master reading and spelling skills simultaneously (Gillingham & Stillman, 1997). Samuel Orton and Anna Gillingham developed an approach entitled Orton-Gillingham, a system based on phonics that incorporated the integration of three learning channels: visual, auditory, and kinesthetic-tactile (Gillingham & Stillman, 1997).

In 1960, Anna Gillingham and her educational counterpart Bessie Stillman published a comprehensive text supporting the Orton-Gillingham approach, entitled Remedial Training for Children with Specific Disability in Reading, Spelling and Penmanship (Gillingham & Stillman, 1960). This remediation manual supported Orton’s theories and reinforced the efficacy of Orton and Gillingham’s philosophy of teaching the alphabetic method through multisensory principles of instruction (Gillingham & Stillman, 1997). This manual also supplemented Orton’s ideology on the effectiveness of multisensory techniques, and focused on the best method for teaching the structure of written English in order to enhance both decoding and encoding skills (Gillingham & Stillman, 1960).

Orton and Gillingham’s theories focused on phonetically-based approaches, with particular attention to alphabetic principles, and was reinforced by psychologist and researcher Jeanne Chall (Chall, 1967). Chall (1967) advocated the need to explicitly teach phonics in order to instill solid literacy skills. In 1967, Chall published a book entitled Learning to Read: The Great Debate, which outlined this specific method. After spending years of observing instruction in classrooms,
examining research studies, and interviewing educational professionals, Chall (1967) recognized
the significance of developing a direct relationship between explicit instruction and systematic
phonics for children who possessed disabilities, particularly in the primary grade levels.
Furthermore, Chall’s (1967) research focused on a code emphasis method for the development of
word recognition and encoding. These findings reinforced the importance of an instructional
paradigm based on multisensory structured language programs encompassing explicit and
systematic practices (Chall, 1967).

Historical researchers who pioneered multisensory instructional methods generated
practices that served as a prelude to meet the demands of 21st century educational skills to increase
student achievement. The No Child Left Behind Act (NCLB; 2001) deemed explicit phonics
programs to be an essential directive under the Reading First program, which was grounded on
incorporating scientifically-based reading programs using teaching methods that have been
validated. Following these directives, the Common Core State Standards (2010) were developed
as a federal initiative in education to establish national reading proficiency in the area of oral
reading no later than third grade. These mandates aimed to prioritize education by reforming
standards in literacy on a state and national level (CCSS, 2010; NCLB, 2001).

**Implicit versus Explicit Phonics.** Over recent decades, the debate over the best reading
programs and approaches that are most effective for student achievement has been ongoing
(Reyhner, 2008). As a result, approaches to reading instruction have been divided between
implicit and explicit phonics instruction. In implicit phonics instruction, “children are expected to
induce the sounds that correspond to letters from accumulated auditory and visual exposure to
words containing those letters” (Beck & Juel, 1995, p. 6). This method differs from explicit
phonics because multisensory practices align with explicit instructional methods in which students
are directly taught the sound-symbol correspondence for individual phoneme segments (Hiskes, 1998). This approach gives students a code for generating word formations. Beck and Juel (1995) argued that obstacles of implicit phonics stem from the lack of direct skills that students acquire to identify sounds in words due to difficulties experienced in sound segmentation or in the process of isolating sounds within words. Furthermore, past research indicated that students were able to acquire 30,000 words by third grade with explicit instruction in comparison to a mere 900 words with instruction in implicit phonics (Hiskes, 1998). Hence, implicit phonics instruction does not support multisensory instructional practices (Hiskes, 1998).

The cornerstone element in multisensory teaching practices is concentrated highly on explicit phonics (Blevins, 2003). This type of instruction is delineated, developed, and formulated cohesively through specialized methods of instruction - all fundamental teaching principles for students who may be at risk for reading difficulties. Explicit instruction is defined as “teaching in which the sound-spelling relationships are directly taught” (Blevins, 2003, p. 1). Additionally, this type of instruction is systematic because it follows a direct sequence where skills are consistently reviewed and integrated into texts (Blevins, 2003). Research states that explicit instruction is most successful for students who may be predisposed to reading problems (Adams, 1990; Anderson et al., 1985; Chall, 1996; Evans & Carr, 1985; Honig, 1995; Stahl & Miller, 1989).

Explicit phonics enables students to apply the phonemic decoding skills required to decode words, and it allows students to understand the connection between letters and sounds (Beck & Juel, 1995). This type of correspondence between phonemes (the smallest speech unit) and graphemes (the smallest letter component of a writing system) are the preliminary skills that are needed in explicit phonics to identify the relationship between sound-symbol correspondences in words (Cullingham, 2013). The objective of explicit phonics is for students to be able to decode
words both in isolation and connected text reading following the application of letter-sound correspondence (Cullingham, 2013).

Explicit phonics is pivotal for achievement for students with learning difficulties who exhibit core phonological deficits (Blevins, 2003; McIntyre & Pickering, 1995). Therefore, the matrix of multisensory structured language programs, developed by the International Dyslexia Association (2007), calls for explicit programs of instruction rather than implicit programs because explicit programs foster multisensory instruction. Since the core difficulty in reading is based on a phonological deficit, research indicates that a multisensory structured language curriculum should embody specially designed content and principles of instruction that are fundamental and embed visual, auditory, kinesthetic, and tactile modalities (IDA; 2000, 2001, 2007; Shaywitz, 2003; Torgeson, 1998).

**Research-based key elements developed by the National Reading Panel.** As the debate between explicit and implicit phonics has been controversial with regards to which approach is more effective to increase student achievement, it has become evident that proper methods of literacy instruction are vital for students with learning deficits to access curriculum content (Cullingham, 2013). Literacy instruction specifically aligns with the NCLB (2001) and provisions of the CCSS (2010), regulations at the federal and state level which set high standards for every child. There has been increased demand centered on what components are fundamental for students to develop solid foundational reading skills. Based on the need for more rigor being a fundamental element in literacy due to state and federal educational provisions, there has been a heightened urgency for students to develop solid foundational reading skills. Reading is particularly critical for students who exhibit learning disabilities, specifically because 75% to 80% of students who exhibit learning difficulties possess reading problems (Learning Disabilities
Association of America, 2015). Given the immediate need to address reading failure on a national level, the NRP (2000) was formed in 1997 by Congress.

The NRP (2000) conducted extensive research on the essential components for literacy programs that are effective for teaching children how to read, and determined that proper instructional reading methods need to be put in place for students to develop foundational reading skills. Aiming to develop a sound plan for effective reading instruction with recommendations for improving instructional practices focused on literacy, the NRP (2000) cited five elements of reading instruction that are central to teach and improve literacy: “phonemic awareness, phonics, fluency, vocabulary, and comprehension” (as cited in Reading Horizons, 2014, pp. 1-5).

**Phonemic awareness.** The panel asserted that *phonemic awareness* was a crucial component of literacy instruction. Phonemic awareness is “the ability to focus on and manipulate phonemes, or speech sounds, in spoken syllables and words” (Shaywitz & Shaywitz, 2007, p. 75). Bradford (2010) asserted that “research has shown that phonemic awareness is strongly related to success in reading and spelling acquisition” (p. 1). The goal of early literacy development is to acquire a solid understanding of the alphabetic principle and to obtain mastery of identifying words. This alphabetic principle is based on the relationship between letters and sounds. Sound-symbol correspondence is a foundational skill for students to master prior to progressing to word recognition skills (Fletcher, Lyon, Fuchs, & Barnes, 2007).

In order to validate the NRP’s (2000) findings, an extensive meta-analysis study was performed examining the effects of phonics instruction and the instructional outcomes this specific study incorporated on the efficacy of systematic phonics (as cited in Ehri, Nunes, Stahl, & Willows, 2001). This study included 66 treatment control comparisons taken from 38 experiments ranging from six weeks to three years over a 30-year time frame (Ehri et al., 2001). Ehri et al.
(2001) evaluated the efficacy of systematic (explicit) phonics instruction in comparison to unsystematic (inexplicit) phonics instruction in grades ranging from kindergarten to sixth grade. Conclusions generated from this study demonstrated that “systematic phonics instruction helps children learn to read,” emphasizing the significance to embed multisensory, explicit, and systematic phonics instruction to prevent later reading difficulties, particularly for students who were considered to be at risk in reading (Ehri et al., 2001, p. 393).

**Phonics.** The second central element of reading instruction is phonics. Students who have mastered fluency in phonics are skilled readers who are able to blend and segment sounds within words because they understand the representation of phonemes; hence, these students do not have to rely on rote memorization to retrieve words accurately. The NRP (2000) stated that phonics difficulties served as the main reason for hindering success in oral reading fluency. The panel also advocated for direct phonics instruction (NRP, 2000). As a result, the NRP (2000) has advocated for a multisensory instructional paradigm for teaching a scope and sequence in encoding, decoding, and comprehension that supports phonics-based instruction.

**Fluency.** The third central element in reading instruction is fluency. In order to progress from phonics to fluency, Shaywitz (2003) highlighted the importance of “training the brain” (p. 268) by using phonetic-based programs that are explicit and systematic. Feedback, guidance, and overlearning of principles regarding instruction are critical elements that must be incorporated into a regimented multisensory program to build students’ fluency skills (Shaywitz, 2003). Tolman (2005) further emphasized the importance of teaching fluency acquisition as early as kindergarten (as cited in Moats, Dakin, & Joshi, 2012). This practice is of particular importance for students who are performing below grade level expectations in the area of literacy (as cited in Moats, Dakin, & Joshi, 2012). Tolman (2005) further asserted that “systematic, explicit practice is
needed for the dysfluent reader” (as cited in Moats, Dakin, and Joshi, p. 75). These researchers agreed that explicit instruction plays a significant role in students’ abilities to develop seamless fluency skills in reading. The NRP (2000) concluded that guided oral reading that is repeated requires direct guidance and feedback from highly qualified teaching professionals.

Vocabulary. The fourth central element in reading instruction is vocabulary. Vocabulary is a skill that is taught both directly and indirectly to students in the primary grades by exposure through print (NRP, 2000). Students who are not proficient in literacy and possess limited vocabulary skills may require repeated exposure to books read aloud, in person, or on tape to gain access to higher-level vocabulary word acquisition. Vocabulary instruction must include presenting vocabulary in varying contexts, direct explanation of vocabulary words, and indirect print exposure (NRP, 2000). Furthermore, the NRP (2000) argued that the use of explicit instruction in rich and robust environments, incidental learning, and the use of digital technology can potentially expand students’ vocabulary skills. Vocabulary skills are critical for reading comprehension skills; therefore, to ensure their proliferation, students generally require multiple methods of teaching in order to acquire vocabulary concepts with fluidity (NRP, 2000).

Reading comprehension. The fifth and final element is reading comprehension. Reading comprehension is essential for students to derive meaning from connected text reading, and particularly important for those who exhibit learning impediments. In order to master the process of reading for comprehension, students need to be able to decode words with fluency and accuracy (Torgeson, 1998). The NRP (2000) stressed the importance of combining metacognitive techniques to facilitate the acquisition of reading comprehension, including generating, answering, and summarizing information. Torgeson (1998) stated that reading with comprehension requires two elements, which consist of: “(a) general language comprehension; and (b) the ability to
accurately and fluently decode words in print” (p. 33). Tolman (2005) further argued that particular attention must be given to “students who do not learn to decode on grade level by the end of third grade, as these groups are typically at-risk for low vocabulary and comprehension skills” (as cited in Moats, Dakin, and Joshi, 2012, p. 76). This component of literacy further supports the need to incorporate instructional methods that are explicit in order for students to develop the comprehensive reading skills needed to access curriculum content upon transitioning to third grade.

The NRP (2000) aimed to develop a research-based literacy program that has since been proven effective for struggling readers, including individuals with learning difficulties. This element is of particular importance for this population of learners given that a majority of students with learning difficulties struggle in the area of literacy. The study and guidelines of the NRP (2000) emphasized both spoken and written language. The NRP’s findings are further validated by Torgeson (1998), who proposed that features which support literacy for students with difficulties in reading proficiency should be “(a) the right kind and quality of instruction delivered with the (b) right level of intensity and duration to (c) the right children at the (d) right time” (p. 34). The incorporation of these features in Torgeson’s research with the combination of the NRP’s (2000) guidelines can potentially lead to significant gains in overall reading skill development.

The recommendations of the NRP (2000) have been fundamental with regard to providing instructional practices that are research-based and support multisensory, explicit, and systematic teaching practices that focus on “phonics, phonemic awareness, vocabulary, fluency, and comprehension” (as cited in Reading Horizons, 2014, pp. 1-5). Don Langenburg (2000), who served as the NRP Chairperson, maintained, “children at risk for reading failure especially require direct and systematic instruction in these skills” (p. 11). Additionally, the International Dyslexia
Association (2007) endorsed the recommendations of the NRP by developing a multisensory matrix that focused on the five vital elements of literacy acquisition. Table 1 demonstrates the integration of multisensory, explicit, and systematic practices with the five literacy skills recommended by the NRP (2000) to support the central reading elements of each and every literacy program.

Table 1

<table>
<thead>
<tr>
<th>Central Reading Elements</th>
<th>Phonemic Awareness</th>
<th>Phonics</th>
<th>Fluency</th>
<th>Vocabulary</th>
<th>Reading Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multisensory, Explicit, and Systematic Components</td>
<td>Letter-sound relationships (e.g., <em>cat</em> has 3 phonemes: <em>c</em>-a-t)</td>
<td>Syllabic skills, word recognition, spelling rules</td>
<td>Tasks and applications of fluency-building and text reading</td>
<td>Morphemes, semantics, and syntax connected</td>
<td>Text comp., narrative or expository text, discourse, and pragmatics</td>
</tr>
</tbody>
</table>


Consequently, multisensory, explicit, and systematic teaching practices are parallel to the five essential elements for reading (phonemic awareness, fluency, phonics, vocabulary, and reading comprehension) (as cited in Reading Horizons, 2014, p. 1). The goal in this proposed study is to ensure that effective instruction is leveraged directly to the embedded components derived from the recommendations made by the NRP (2000) and are implemented across the two main areas within this study: encoding and oral reading.

**Correlation of National Reading Panel with Content and Principles of Instruction**

The five essential elements identified by the NRP (2000) are tailored to support instructional approaches by using multisensory, explicit, and systematic teaching practices focused on specialized content and principles of instruction (IDA; 2000, 2001, 2007). In multisensory
teaching, the content and principles of instruction centered on processing the phonological features of language are crucial for student achievement (McIntyre & Pickering, 1995). These same principles are critical in order for students who exhibit learning disabilities to acquire the skills essential to achieve reading for mastery (McIntyre & Pickering, 1995). The content taught consists of phonemic awareness, phonology, morphology, sound-symbol correspondence, semantics, syntax, and syllable instruction. McIntyre and Pickering (1995) identified the significance of specialized content in multisensory structured language programs, including the following seven components:

- **Phonology**: The framework of speech sounds in a language.

- **Phonemic awareness**: The smallest sounds in language that constitute phonemes (sounds). For example, the *d* in “dog” and the *m* in “mat” are considered two different sounds.

- **Sound-symbol correspondence**: Saying a letter that corresponds with the sound the letter produces.

- **Syllable instruction**: Teaching of the six syllable types that constitute the English language. These are titled closed, open, vowel-consonant-*e*, diphthong, consonant-*le*, and r-controlled.

- **Morphology**: The smallest building block of word meaning (e.g., root word, prefix, suffix).

- **Syntax**: How sentences are structured and the patterns of rules they follow to conform to language standards identified within the English language.

- **Semantics**: The relationship bounded by language and word meaning in sentences, phrases, and reading in context.
Syllable patterns of the English language. The structure of the English language consists of six syllable patterns with varying degrees of complexity (Gillingham & Stillman, 1997). As students begin to acquire an understanding of syllable types and patterns that govern the English language, they are then able to apply sound-symbol skills to isolated word reading and connected text reading by utilizing a guiding code and specialized strategy on how to break up syllables cohesively to read words fluently (Knight-McKenna, 2008). Ultimately, these syllable types serve as a prelude to help students decode multisyllabic words within the context of oral reading, followed by applying skills independently. As a result, students become familiar with the internal structure incorporated in the recognition of words, decode words using word analysis strategies, and read with fluency and accuracy by applying the principles of phonology (sound structure of language) and orthography (representation of sounds by printed symbols) in conjunction with one another (Knight-McKenna, 2008). These syllable types are defined in Table 2 with supporting examples of all six syllabic patterns.

Table 2

<table>
<thead>
<tr>
<th>Syllable Pattern</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed</td>
<td>Ends with a consonant: vowel before the consonant has a short sound.</td>
<td>not, that, led</td>
</tr>
<tr>
<td>Open</td>
<td>Ends in a vowel: vowel makes its long sound.</td>
<td>no, I, a</td>
</tr>
<tr>
<td>Vowel-consonant-e</td>
<td>Ends in a vowel-consonant-*e syllable: e is silent at the end of the word and makes the vowel before it have a long sound.</td>
<td>note, mule, same</td>
</tr>
<tr>
<td>Vowel team (diphthong syllable)</td>
<td>Two vowels together that make one sound.</td>
<td>nail, eat, out</td>
</tr>
<tr>
<td>R-controlled syllable</td>
<td>Contains a vowel followed by r: r comes directly following the vowel and r gives vowel a</td>
<td>bird, her, start, port</td>
</tr>
</tbody>
</table>
Consonant-\textit{le} \\
Always comes at the end of a word: only the consonant and the \textit{l} are pronounced while the \textit{e} remains silent.

\begin{tabular}{|l|l|}
\hline
\textbf{Syllable Pattern} & \textbf{Definition} & \textbf{Examples} \\
\hline
VC/CV & Underline vowels and label them, label two middle consonants, and divide between two consonants. & vc/cv-sunset \\
Vowel-Consonant/Consonant-Vowel & & \\
VC/V & Underline and label vowels, label middle consonant & vc/v-wagon \\
\hline
\end{tabular}


Since students with learning impediments often experience difficulty learning through traditional teaching methods, students are able to use a coding system to break apart words phonetically (Gillingham & Stillman, 1997). Students are then able to utilize strategies designed to foster accuracy and fluency in reading words by breaking them apart into segmented syllables for students. In turn, this makes the process of reading more feasible for students to decode isolated words and words within a connected text fluently. Gillingham and Stillman (1997) emphasized that these particular skills are imperative for students with learning disabilities because “hundreds of big words are composed largely or entirely of phonetic syllables” (p. 53).

Consequently, syllable patterns are important components of multisensory, explicit, and systematic instructional methods based on the distinct scope and sequence that govern these principles. Syllable division patterns are also used in multisensory teaching principles (Briggs, 1996). These patterns provide students with a strategic method for decoding words in order to read with increasing fluency and accuracy. Syllable patterns are shown in Table 3.

Table 3

\textbf{Syllable Patterns, Examples, and Rules That Follow Syllabication Patterns}
<table>
<thead>
<tr>
<th>Vowel-Consonant/Vowel</th>
<th>between vowels, and divide after the first consonant.</th>
</tr>
</thead>
<tbody>
<tr>
<td>V/CV</td>
<td>Underline and label vowels, label middle consonant</td>
</tr>
<tr>
<td>Vowel/Consonant-Vowel</td>
<td>between vowels, and divide directly following the first vowel.</td>
</tr>
<tr>
<td>V/V</td>
<td>Underline and label both vowels and divide between vowels.</td>
</tr>
<tr>
<td>Vowel/Vowel</td>
<td></td>
</tr>
<tr>
<td>VC/CCV</td>
<td>Underline and label vowels, mark pattern with v over vowels and c over consonants; divide word after first consonant.</td>
</tr>
</tbody>
</table>

**Note.** Adapted from *Syllable division practice pad* by M. Briggs, 1996, pp. 1-62. Copyright 1996 by Cambridge Teachers Press. Adapted with permission.

In addition to the content taught using a multisensory, explicit, and systematic approach, multiple principles must be implemented into a structured language program to utilize all learning channels-visual, auditory, kinesthetic, and tactile modalities. According to the International Dyslexia Association (2000), these principles include the following:

- **Simultaneous, multisensory instruction (visual, auditory, kinesthetic, and tactile):** The pathways for learning are utilized through all senses.

- **Systematic and cumulative instruction:** Language is taught through a sequential series of steps from concrete to abstract with the goal of strengthening memory.

- **Direct instruction:** Explicit teaching of learning concepts, in which consistent interaction between teachers and students is ongoing throughout each instructional lesson.

- **Diagnostic teaching:** Practitioners must be able to individualize teaching methods, which can be accomplished by assessing the needs of students on a continual basis.
• **Synthetic and analytic instruction:** Multisensory programs should possess synthetic and analytic instruction. Synthetic instruction advances from parts to the whole and analytic instruction proceeds from the whole to its cohesive components.

• **Comprehensive and inclusive instruction:** Instruction targets all areas of language, including phonemes, graphemes, morphemes, semantics, syntax, discourse, and pragmatics.

These principles incorporate step-by-step instruction, with a sequential process that progresses in a logical order. The pace of instructional content must be flexible to meet the needs of students with disabilities and different learning styles. Furthermore, isolated skills should be continually taught until students obtain solid mastery strategically (McIntyre & Pickering, 1995). The overarching goal of multisensory teaching that is explicit and systematic is to help students apply the rules that influence the structure of language, which are delineated cohesively and concisely (IDA, 2000). Each rule involves teaching the sequence and scope of language systematically, comprehensively, and through an approach that involves direct teaching of strategies, skills, and concepts (McIntyre & Pickering, 1995). The combination of all learning modalities taught (visual, auditory, and kinesthetic-tactile) creates an individualized approach to teaching for learners who require specialized teaching methods to master skills involved in literacy acquisition and are unable to access content through conventional teaching techniques (McIntyre & Pickering, 1995).

Multisensory, explicit, and systematic interventions that support specific principles of instruction are imperative for students who exhibit learning impairments and reading deficits (IDA, 2000). Due to the degree of specialization required for each student, there is no single program deemed suitable for all students who possess learning needs (Dyslegia, 2010). IDA (2000)
asserted that it is critical to incorporate a fluid and seamless repertoire of instructional practices, approaches, and methods for students within the population of students with learning detriments. Furthermore, the National Joint Committee on Learning Disabilities (2006) reinforced the need for multisensory, instructional-based programs for students who exhibit learning disabilities, emphasizing the usefulness of programs that are “explicit, systematic, and comprehensive” (p. 10). Students are capable of achieving solid knowledge and developing fundamental skills based on the way instruction is delivered. Therefore, the specialization of these teaching methods are significant steps towards maximizing literacy skills for students with learning impediments.

Content and principles of instruction are fundamental in the application of multisensory, explicit, and systematic strategies, which are aimed at improving literacy skills. The content of multi-modality practices is imperative for students to understand and make meaningful connections based on the structure of the English language (International Multisensory Structured Language Council, 2015). Additionally, the instructional principles embedded in multisensory teaching allow reading approaches to incorporate systematic, explicit instruction that progresses in a sequential format. The International Multisensory Structured Language Council (2015) asserted, “The goal of any multisensory structured language program is to develop a student’s ability to read, write, and understand the language studied” (para. 1). Hence, what content is taught and how principles are implemented are tailored to the five pillars of reading acquisition and serve as the preliminary components designed to increase literacy competence for students with learning deficits (McIntyre & Pickering, 1995).

Quality and Delivery of Research-Based Multisensory Programs

As increased attention to multisensory, explicit, and systematic instruction has focused on the fidelity of implementation, early intervention, and high-quality teaching practices, these three
elements are essential for student achievement. To support these three pillars aimed at raising achievement scores in spelling and oral reading for students with learning difficulties, a report was generated by ten organizations in a learning disabilities roundtable discussion (American Institutes for Research, 2002). The organizations noted, “Interventions are most effective when they are implemented consistently and with fidelity, with a sufficient level of intensity, and are relevant to student needs” (American Institutes for Research, 2002, p. 9). Further research that received recognition was within professional development content, targeted specifically to knowledge and skills required to successfully implement interventions. To better service students with learning deficits, supplemental challenges incorporated the need to intervene early for students considered to be at risk for failure. Consequently, the quality and delivery of literacy programs to support students with disabilities were two essential elements in the roundtable report with respect to this population.

As heightened demands have been put in place to ensure the integrity of implementation by the NCLB (2001) in conjunction with assessments mandated by the state, *fidelity of implementation* is fundamental to provide appropriate instruction and ensure that students achieve positive academic outcomes. Additionally, the delivery as well as the extent to which programs are implemented is imperative to student achievement. Upon implementation of reading interventions, Shaywitz (2003) asserted the importance of intensive instruction with extensive time cycles for students with learning difficulties. As a result, students with learning obstacles who require a multisensory, explicit, and systematic approach must be disposed to both intensity and ample time intervals of instructional supports upon implementation to experience reading achievement (Shaywitz, 2003; Torgeson, 1998).
Early intervention accompanies fidelity of implementation to meet the needs of students with learning difficulties. Highly structured early intervention programs that provide measurable and clearly delineated goals serve as critical components to foster the foundational skills needed for student achievement (Shaywitz, 2001). The National Joint Committee on Learning Disabilities (2006) highlighted that fundamental components in an early intervention selection process should be research-based, aligned with practices based on evidence, and employ consistent progress-monitoring strategies to track instructional performance. Furthermore, the committee asserted the importance of focusing on individualized learning needs while enhancing students’ strengths, thus providing comprehensive instruction that was sequential, and incorporated direct teaching programs (National Joint Committee on Learning Disabilities, 2006). Consequently, students who received instructional services in the primary grade levels experienced a greater likelihood of favorable achievement outcomes.

Torgeson (1998) further accentuated that early intervention is crucial for students who are at risk for reading difficulties. Additionally, CCSS (2010) emphasized that students in grades one through three typically should begin to develop fundamental recognition of words by employing word analysis strategies and cues in context. Once students progress through grades four to eight, conventional school programs expect basic reading conceptual skills to be automatic for most students, and the lessons transition to more complex reading activities (CCSS, 2010). As a result, appropriate supports, in addition to intervention programs, are requisites for students with reading difficulties in order to be able to access literacy-based curriculum content (CCSS, 2010).

High quality instruction is a supplemental element of multisensory, explicit, and systematic structured programs and extremely important in any reading intervention program with students who exhibit learning disabilities and delays (Deshler, Schumaker, & Woodruff, 2004; Shaywitz,
Deshler et al. (2004) testified to the efficacy of powerful instructional methods that were comprehensive, methodical, and receptive to students’ learning needs. Additional components that fostered high quality teaching included direct modeling, guided practice that allowed for independent application of skills, and consistent review of strategic principles (Swanson, 1999). Shaywitz (2003) specifically highlighted a study that involved instruction using one method but generated two different results. The more successful learning outcomes were attributed to high quality teaching instruction. Therefore, teachers delivering instructional methods must be adept and skilled at an effective multisensory, explicit, and systematic scope and sequence that disseminates knowledge effectively to students who possess learning difficulties (Shaywitz, 2003).

To conclude, the implementation of a successful literacy program should encapsulate fidelity of implementation, early intervention, and high quality instruction. Salient factors in research-based programs that support students with learning needs dictate the optimal success or demise concerning interventions of even the highest caliber (Shaywitz, 2003). As a result, prerequisites to a highly structured program include teachers who exhibit exemplary teaching practices and are considered to be highly qualified, frequent sessions in conjunction with substantial time intervals of instruction, and early identification to provide the necessary interventions for student achievement. Consequently, these three elements serve as the building blocks of a comprehensive and well-designed literacy program.

**Empirical Studies That Support Multisensory, Explicit, and Systematic Instructional Practices**

Over the past two decades, various multisensory, explicit, and systematic teaching practices have been implemented for students with learning disabilities and delays that have
supported empirical studies to validate the efficacy of these targeted instructional practices. A large and growing body of literature has investigated the effects that multisensory, explicit, and systematic practices have upon student achievement. These practices have been identified as major contributing factors to academic learning outcomes. Information obtained relevant to specialized practices is largely based upon empirical studies that have examined the effectiveness of these promising practices. Common approaches and programs that support specially designed instruction include Orton-Gillingham, Wilson Reading Program, Lindamood-Bell, and Project Read. A review of empirical studies on multisensory, explicit, and systematic reading interventions has revealed four major themes, which will be discussed in detail below.

**Highly qualified teaching professionals.** The first finding is that high quality instruction by qualified educational professionals is one of the central elements attributed to the success of the most effective reading programs. The President’s Commission of Excellence in Special Education (2002) stressed the importance of highly qualified teachers through research conducted in this field. The organization asserted the relevance regarding the skills that educators must possess in accordance with research-based methods in teaching children how to read. The President’s Commission of Excellence in Special Education (2002) maintained that “teacher preparation for the teaching of reading has not been adequate to bring about the research-based changes in classroom practices that result in academic success” (p. 56). As a result, the levels of student achievement for children with learning deficits continue to be unsatisfactorily low.

Studies of reading intervention programs were conducted in Singapore to support the first finding related to the importance of highly qualified education professionals. Hwee and Houghton (2011) conducted a study to examine the efficacy of the Orton-Gillingham approach on student achievement. The Orton-Gillingham approach is defined as “an instructional approach intended
primarily for use with persons who have difficulty with reading, spelling, and writing of the sort associated with dyslexia” (Academy of Orton-Gillingham Practitioners and Educators, 2012, para. 1). The Orton-Gillingham approach is widely used in a one-to-one model or small group setting and its core central features focus on elements that incorporate a “language-based, multisensory, structured, sequential, cumulative, cognitive, and flexible approach” that teaches formations of words and employs an explicit procedural system for teaching phonics (Academy of Orton-Gillingham, 2012, para. 1).

The Orton-Gillingham approach teaches students to understand and apply rules based on the structure of the English language and uses instructional techniques geared to specific brain pathways to reinforce multisensory learning channels - auditory, visual, and kinesthetic-tactile (Academy of Orton-Gillingham, 2012; Sheffield, 1991). The multisensory component of this approach also emphasizes fundamental concepts and the teaching process of overlearning, with a goal or focus on attaining mastery of skills taught in a logical sequence. Orton-Gillingham is also used with students who possess significant acquisition difficulties in the areas of reading, spelling, and writing (Academy of Orton-Gillingham, 2012).

Educators implementing the Orton-Gillingham intervention in Hwee and Houghton’s (2011) investigation consisted of three female teachers, with five to seven years of teaching experience, who were certified through the Academy of Orton-Gillingham Practitioners and Educators, with a specialization in dyslexia. This study consisted of an experimental group of 77 participants (61 males and 16 females) with dyslexia, ranging in ages from six to eight years old, and implemented a pre-post experimental group design, which was embedded into a hybrid multiple baseline research design (Hwee & Houghton, 2011). There was no control group used in this study based on the nature of this design (Hwee & Houghton, 2011). Subjects in this study
were administered Orton-Gillingham interventions over the course of one year for almost 100 hours of instruction (Hwee & Houghton, 2011).

Scores indicated a main effect considered highly significant, based on a multivariate analysis of variance for Word Recognition Age (WRA), Word Expression Age (WEA), and Sentence Reading Age (SRA) (Hwee & Houghton, 2011). Additionally, Univariate F tests demonstrated modest effects (7–8% variance), although at a level commensurate with educational significance (Hwee & Houghton, 2011). The pre-post test scores were effective on word recognition and word reading, although not on sentence reading achievement (Hwee & Houghton, 2011). Hence, trained and qualified teachers who administered this intervention had an overall effect on student performance in two out of three reading disciplines measured, even though teachers implementing this study were not considered to be a variable that had an effect on the battery of assessments administered (Hwee & Houghton, 2011).

In further support of the first finding with regard to the significance of highly qualified teachers, Joshi, Dalgreen, and Boulware-Gooden (2002) conducted a study to examine the effects of multisensory instruction in comparison to a Houghton-Mifflin Basal Reading Program with first grade students. Lead teachers, classroom teachers, and literacy coaches received 30 hours of training by contracted professionals from the Institute for Multisensory Education (IMSE) in theories and practices derived from this educational institute (Joshi et al., 2002). Moreover, the trainer of the IMSE followed up with three visits to classrooms participating in this study in the fall, winter, and spring. Prior to each visit, teachers recorded the exact type of consultation needed (Joshi et al., 2002). These consultations were comprised of modeling actual lessons, examining data used for assessments, and targeting specific learning needs (Joshi et al., 2002). Teachers received guidance, support, and feedback from the start to end of this study (Joshi et al., 2002).
The treatment group was taught through Language Basics: Elementary - a multisensory approach derived from a decoding-based approach called Alphabetic Phonics (Cox, 1985) - while the control group received conventional basal reading instruction (Joshi et al., 2002). It was noted that the students participating in this study were not cognitively impaired, possessed average intelligence skills, and did not exhibit any known reading disabilities (Joshi et al., 2002). However, there was no mention as to whether or not an educational evaluation was put in place prior to the study to determine whether or not students in the treatment group were eligible for further targeted interventions based upon any known areas of weakness in spelling or reading (Joshi et al., 2002).

The lessons in the treatment group incorporated systematic and explicit instruction in the areas of phonemic awareness, activities centered on the alphabetic principles, oral language, practice in reading and spelling, development of vocabulary, and text comprehension (Joshi et al., 2002). Subjects in this study consisted of four first-grade classrooms in an inner-city district. There were 32 children in the control group and 24 children in the treatment group (Joshi et al., 2002). The control and treatment groups both received 50 minutes of instruction five days per week in literacy (Joshi et al., 2002). Following post-testing, scores demonstrated that the treatment groups scored significantly higher than the control groups, demonstrating growth in the areas of sound/symbol manipulation, fluency in reading, and reading for meaning (Joshi et al., 2002). The control group only showed gains of statistical significance in the area of reading comprehension (Joshi et al., 2002).

The first finding regarding the importance of highly qualified teachers is also supported by further reading intervention studies. Campbell, Helf, and Cooke (2008) analyzed the achievement outcomes of multisensory components through an explicit and systematic phonics program,
employing a multiple-baseline design of six second-grade students in an urban elementary school labeled as treatment resisters. This group was chosen based on participants’ lack of progress in reading fluency and nonsense word fluency following the assessment of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) (Campbell et al., 2008). The subjects under study were administered an additional 10–12 minutes of instruction daily in a supplemental program called Early Reading Tutor (ERT) (Campbell et al., 2008).

The results of this study indicated that the addition of multisensory components yielded increased scores on decoding fluency in VC (vowel-consonant) and CVC (consonant-vowel-consonant) detached syllables (nonsense words), as well as in the area of oral reading fluency (Campbell et al., 2008). Although the effects of oral reading fluency were modest, one of the noted limitations in this study was attributed to the varying degrees of reading knowledge derived from general education teacher expertise (Campbell et al., 2008). Campbell et al. (2008) concluded that “teacher characteristics may have affected the acquisition of decoding skills and impacted on the reading skills measured in this study” (p. 292). Hence, this variable may have contributed to overall scores within this study due to the lack of reading expertise across the content subject matters taught.

**Early intervention practices that are multisensory, explicit, and systematic.**

Multisensory, explicit, and systematic practices are more likely to be effective when implemented early as an intervention to primary grade levels. Shaywitz et al. (2004) analyzed the reading achievement of students using an intervention program that implemented multisensory, phonetically-based methods of instruction with an experimental intervention group, ranging in ages from 6.1 to 9.4 years old. In order to meet the qualifying criteria for reading disabilities, students needed to possess a standard score of 90 or lower on subtests of word attack and word
identification and a mean score of 90 on both subtests together (Shaywitz et al., 2004). Subjects were studied over an eight-month period through a community intervention or an experimental intervention (Shaywitz et al., 2004). Students with general or average reading abilities were assigned to the community control group and received the program intervention that was utilized in the school (Shaywitz et al., 2004). It should be noted that none of the students who were a part of the community intervention received direct, systematic phonics, which were all techniques incorporated in the experimental intervention group (Shaywitz et al., 2004).

Significant gains were noted in the experimental intervention group in the area of oral reading fluency development in comparison to the community intervention cohort (Shaywitz et al., 2004). Subsequently, Shaywitz et al. (2004) analyzed the fMRI results of students in the experimental group and community control group directly following the implementation. Results led to the discovery that several regions in the left hemisphere of the brain showed an elevated activity (Shaywitz et al., 2004). Hence, these fMRI results reflected patterns in the brain similar to typical readers. Shaywitz et al. (2004) deducted that activated brain patterns were contingent upon multisensory strategies that provided explicit and phonics-based instruction at the primary grade levels. The focus on early intervention practices aimed to increase brain activity in sections of the brain responsible for word recognition with the goal of improving oral reading fluency development.

Shaywitz’s (2003) research highlighted that one of the essential elements of reading interventions, which proves to be the most successful, involved early intervention practices. In order to validate research focusing on rewiring brain structures to support early intervention practices, Shaywitz (2003) maintained that “brain imaging evidence that scientifically based interventions can rewire a child’s brain so that it is virtually indistinguishable from that of a child
who has never had a reading problem” (pp. 257–258). Moreover, Shaywitz (2003) noted that
students who were not identified with specific disabilities until third grade had lost a tremendous
quantity of words, resulting in further elevation of the achievement gap with regards to the
required standards of reading in conjunction with grade level performance expectations.
Consequently, early remediation is one of the cornerstone elements for students to acquire the
fundamental skills needed for spelling and reading achievement.

In order to further examine the efficacy with regards to explicit instruction targeted in the
eyearly elementary grades, an external evaluation study was conducted by the Reading Institute
(Hintze, 2009). The Reading Institute is a nonprofit organization, focused on teacher training
strategies that are research-based across varying content areas. The Reading Institute investigated
multisensory reading initiatives by utilizing a combination of the core curriculum and teacher
training, derived from the Project Read program (Hintze, 2009). Project Read is a multisensory
language arts program that encompasses three strands: encoding and decoding, reading
comprehension, and written expression (Hintze, 2009). These three strands include a wide array of
diverse strategies in the areas of phonics, linguistics, report form, story form, and written
expression (Language Circle Enterprises, 2012).

The Project Read program is based on a reading curriculum that executes visual, auditory,
kinesthetic, and tactile modalities, and was first recognized in 1969 following the implementation
of a Project Read pilot study in the Bloomington, Minnesota Public School District (Language
Circle Enterprises, 2012). This program aligns with the five central elements of reading
instruction, which include “phonemic awareness, phonics, fluency, vocabulary, and
comprehension” (as cited in Reading Horizons, 2014, pp. 1-5). Moreover, Project Read is
intended for use with students ranging from kindergarten through grade 12 (Hintze, 2009). The
program focuses on targeted instruction that is direct and systematic, where each skill taught builds on previous skills, which students can practice extensively because of the level of detail provided within the program (Hintze, 2009).

The Reading Institute study focusing on Project Read was implemented in Williamstown, MA at Stanislaus Kostka School, a preK–8 school that enrolled 144 students with class sizes between 10 and 20 students at the time of the study (Hintze, 2009). The assessments used to measure progress included the Dynamic Indicators of Early Literacy Skills (DIBELS) and the Group Reading Assessment of Diagnostic Evaluation (GRADE), which were administered in the early fall and late spring to measure growth (Hintze, 2009). Additionally, progress was monitored on a weekly basis using alternate formats of the DIBELS instrument. Areas of targeted multisensory instruction consisted of phonemic segmentation fluency, rhyming, word reading, oral reading fluency, vocabulary comprehension, passage comprehension, and listening comprehension (Hintze, 2009). Although statistically significant gains were noted across kindergarten through sixth grade in the areas of phonics, fluency, vocabulary, and comprehension, there were a variety of identified sophisticated scores that occurred at the primary grade levels (Hintze, 2009). The results of the DIBELS indicated that kindergarteners’ initial sound fluency scores expanded on a weekly basis by nearly 2 points; first graders made improvements in oral reading fluency by 2.72 words per week; second graders increased in ORF by 2.97 words per week; and third graders progressed by 2.11 words weekly (Hintze, 2009).

**Frequency and duration of multisensory, explicit, and systematic practices.** A third major finding within previous research-based programs is that multisensory, explicit, and systematic practices must be taught in conjunction with delivery of instructional practices that incorporate a substantial level of frequency (rate of which teaching occurs and is repeated over a
specified period of time) and duration (length in time instructional sessions are conducted) (Wernikoff, 2007). To validate this finding, Wilson and O’Connor (1995) used a pre-test, post-test design to determine the overall effects of reading performance, using instruction derived from the Wilson Reading Program. The Wilson Reading Program is a multisensory program based on the philosophy of Orton-Gillingham and consists of a 12-step program for decoding, encoding, and comprehension (Wernikoff, 2007). The key elements incorporated in this program emphasize skills in phonemic awareness, decoding-fluency-word analysis, the alphabetic principle, encoding, vocabulary, comprehension, and metacognition (Wernikoff, 2007). Multisensory components involved in the program include hearing and manipulation of sounds, exercises in finger tapping, writing tasks, constructing syllable types, and reinforcing auditory skills through listening comprehension activities (Wilson Reading System, 2010).

Wilson and O’Connor (1995) conducted a study that investigated 220 students, which consisted of 92 students from grades 3-4 and 128 students from grades 5-12. The study maintained that students who exhibited learning disabilities made no progress in prior targeted intervention programs implemented in a one-on-one setting (Wilson & O’Connor, 1995). Additionally, this study demonstrated that one-third of students were performing at least one year below their grade level preceding the implementation of the intervention (Wilson & O’Connor, 1995). A total of 62 instructional lessons took place, averaging two to three lessons per week in a one-on-one setting over a one-year time frame (Wilson & O’Connor, 1995). The Woodcock Reading Mastery Test, a norm-referenced test, was used to assess reading gains (Wilson & O’Connor, 1995).

The results from this study indicated positive gains for students (Wilson & O’Connor, 1995). A majority of the students in third through twelfth grade participating in the study demonstrated significant increases in word analysis, spelling, comprehension, and full-scale
reading skills, indicating that nearly half of the subjects in this study exhibited reading growth (Wilson & O’Connor, 1995). Although the level of daily duration was not disclosed in this study, historically the recommended length of instructional sessions in the Wilson Reading Program has demonstrated practices between 60 and 90 minutes per day (Wilson Reading Program, 2010). Given that daily lessons in this study ranged from two to three times per week over a one-year time frame, the results provided evidence that supports the effectiveness of both frequency and duration obtained from the positive academic learning outcomes for the subjects participating in this study (Wilson Reading Program, 2010).

Frequency and duration levels have been implemented in additional studies. Hook, Macaruso, and Jones (2001) examined two reading intervention programs to explore the effectiveness of these approaches in the areas of phonemic awareness and word identification, with a subgroup of 33 Caucasian students from middle to upper-middle-class socioeconomic backgrounds. The groups examined were the Fast For Word (FFW) group as well as a longitudinal control (LC) group that received multisensory instruction, and an Orton-Gillingham (OG) group for a time span of two years (Hook et al., 2001). The FFW treatment group, an educational software program that focuses heavily on phonological awareness, worked two hours each day, five days per week, while the Orton-Gillingham treatment group worked one hour per day, five days per week (Hook et al., 2001). The longitudinal group was compared only to the FFW group (Hook et al., 2001). Eleven children constituted the FFW group and nine children comprised the Orton-Gillingham group; ages ranged between 7-12 years old (Hook et al., 2001). Students who qualified for this study were required to meet specific criteria that they had to have (a) a full-scale IQ score of 80 or higher, (b) a verbal IQ score of 90 or higher, (c) scores lower than the 16th percentile of either word attack and/or word identification subtests, and (d) a verbal IQ of a
minimum of one standard deviation higher than word identification and/or word attack scores (Hook et al., 2001).

Both groups made gains that were similar in the area of phonemic awareness (Hook et al., 2001). The FFW group did not demonstrate gains that were noted as significant in the area of word attack in comparison to the students who received instruction in the Orton-Gillingham approach (Hook et al., 2001). However, both groups showed significant growth in the areas of reading and phonemic awareness (Hook et al., 2001). Conclusions drawn from this study indicated that the levels of instructional frequency and duration in the FFW group and the Orton-Gillingham approach clearly contributed to achievement gains throughout individual subareas related to phonological awareness and oral reading.

The third finding is also supported by the Institute for Multisensory Education Development. IMSE endorsed an empirical study completed in Oswego, Illinois during the course of the 2008-2009 school year (Hintze, 2009). Students who were identified as at risk in the primary grades received interventions in small groups five days a week for 30 minutes each day, totaling a duration of 150 minutes per week (Hintze, 2009). After professionals received 30 hours of training in order to implement multisensory interventions in small group sessions for an undisclosed period of time, four varied assessments were administered (Hintze, 2009). Overall, 76% of the specified 225 first grade at-risk students were able to achieve targeted scores in literacy across word decoding and comprehension based on the achievement tests of the Gates-MacGinitie Reading Test, and improved scores in accordance with the AIMSweb R-CBM Benchmarking Probes (Hintze, 2009). Therefore, the level of frequency and duration clearly contributed considerably to students’ reading achievement (Hintze, 2009).

Alternative studies have demonstrated great strides attributed to frequency and duration of
Scheffel, Shaw, and Shaw (2008) coordinated a study used to examine the efficacy of the Orton-Gillingham approach. Scheffel et al. (2008) implemented their study across three high-needs elementary schools in the state of Colorado, which consisted of treatment groups and comparison groups in the first grade. Prior to the implementation of this study, lead teachers, classroom teachers, and literacy coaches received 30 hours of training in instructional practices, the philosophy behind these practices, and methods derived from the IMSE (Scheffel et al., 2008). Following the training, teachers were given the resources that served as a requisite to teach the curriculum of study (Scheffel et al., 2008). Additionally, trainers from the IMSE visited the three schools of study in the fall, winter, and spring (Scheffel et al., 2008). In preparation for visiting each school, trainers requested teachers to fill out a template, indicating what type of consultation they required to help educators implementing teaching methods guide the procedures of instruction (Scheffel et al., 2008).

The instrument used to assess student growth was the DIBELS assessment (Scheffel et al., 2008). The treatment group that received the Phoneme Segmentation Fluency subtest began at a high-risk percentage of 18.3% in the fall and progressed to a high-risk percentage of 0.9% in the spring (Scheffel et al., 2008). The comparison group started at a high risk percentage of 22.9% in the fall and dropped to 1.7% by the spring (Scheffel et al., 2008). The treatment group received instructional interventions utilized by the IMSE program for a duration of an additional 30 minutes per day, five days a week (Scheffel et al., 2008). The study noted that two schools implemented the program for a period of nine months, and the third school implemented the program for six months (Scheffel et al., 2008).

The significance of frequency and duration has been noted in supplementary studies. Oakland, Black, Stanford, Nussbaum, and Balise (1998) conducted a study entitled the Dyslexia
Training Program (DTP), a remedial reading intervention program. DTP, an adaptation of the multisensory program entitled Alphabetic Phonics (derived from Orton-Gillingham), is a curriculum that has generally implemented an instructional sequence of 350 one-hour teaching sessions targeting fundamental and linguistic skills (recognition of letters to syllabication knowledge) (Oakland et al., 1998). In Oakland et al.’s (1998) study, the subjects in this study included fourth graders with diagnosed reading disabilities, and they were observed over a two-year time frame. The goal was to examine the efficacy of reading and spelling achievement through embedding multisensory teaching methods into daily instruction (Oakland et al., 1998).

In Oakland et al.’s (1998) study, the control group consisted of 26 students, while the treatment group encompassed 22 students. Instructional sessions occurred 5 days a week for 10 months over a two-year time period that elapsed (Oakland et al., 1998). The trajectory of instruction for the control group was based on typical reading instructional methods, which was a core element of the regular curriculum (Oakland et al., 1998). Significant gains were noted in the treatment group throughout the two-year period in the areas of word recognition and text comprehension in comparison to the control group after two years (Oakland et al., 1998). There were no differences in spelling achievement (Oakland et al., 1998). This study demonstrated that the levels of frequency and duration were significant, specifically for students with reading disabilities (Oakland et al., 1998).

**Effects of progress monitoring.** The fourth major finding is that progress monitoring is a critical component when implementing best practices in a multisensory, explicit, and systematic curriculum (Knight-McKenna, 2008). To support the importance of progress monitoring within reading intervention programs, an empirical study of the program Lindamood-Bell demonstrated that both the *Seeing Stars* and *Visualizing and Verbalizing* instructional methods increased both
decoding and comprehension skills for students, following eight weeks of reading intervention instruction (LindaMood-Bell Learning Processes, n.d.). The Lindamood-Bell Program, created by Nanci Bell and Patricia Lindamood, is a multisensory, explicit, and systematic program that focuses on fundamental content areas of literacy. Lindamood-Bell uses two main programs for decoding: (a) Seeing Stars and (b) Lindamood Phoneme Sequencing (LiPS) (LindaMood-Bell Learning Processes, n.d.). Both programs focus on developing phonemic awareness by executing instructional methods geared towards specially designed skills and strategies (LindaMood-Bell Learning Processes, n.d.). The comprehension programs incorporated in Lindamood-Bell are entitled Visualizing and Verbalizing and the Talkies program (LindaMood Bell-Learning Processes, n.d.). These programs focus on concept imagery, oral language comprehension, vocabulary, and critical thinking using multiple learning pathways (LindaMood-Bell Learning Processes, n.d.). The instructional content of Lindamood-Bell is designed to help students become fluent in oral reading, encoding, and reading comprehension (LindaMood-Bell Learning Processes, n.d.).

Krafnick, Flowers, Napoliello, and Eden (2011) conducted a study involving LiPS at a privately-based school that focused on students with dyslexia, which incorporated observing changes in the brain following the implementation of intensive reading interventions. Krafnick et al.’s (2011) study involved 11 students with dyslexia who participated in an eight-week training focusing on mental imagery and spoken letters with a kinesthetic component involving tracing phonemes, letter groups, and words. Following this intervention, students underwent an eight-week control period during which there was no intervention administered (Krafnick et al., 2011).

Krafnick et al.’s (2011) findings indicated that changes in the brain solely occurred following the implementation of the actual intervention. In order to measure the effects of this
reading intervention, a one-way repeated measures ANOVA was orchestrated, followed by *post hoc* t-tests (Krafnick et al., 2011). The results demonstrated significant within-subjects effects for phonemic awareness, word attack, word identification, reading comprehension, rapid naming, and symbol imagery (Krafnick et al., 2011). Furthermore, *post hoc* t-tests indicated that the clusters established by ANOVA showed an increase in gray matter volume within the brain (Krafnick et al., 2011). The only test that did not demonstrate significant changes was in the area of working memory (Krafnick et al., 2011). Conclusions generated from this study demonstrated that specific reading interventions can bring about alterations in brain structures, in view of substantial evidence that gray matter volume in brain structures were specifically monitored following both the eight-week intervention and null period (Krafnick et al., 2011). Time points 1 and 2 demonstrated an increase in gray matter volume, while time points 2 and 3 (control) indicated no changes (Krafnick et al., 2011). As a result, increased reading scores consorted with gray matter volume changes (Krafnick et al., 2011).

Progress monitoring has been embedded in alternative multisensory reading intervention studies. Vaughn, Linan-Thompson, and Hickman (2003) conducted an examination of three schools in the state of Texas, which incorporated a method of progress monitoring entitled Response to Treatment. The nature of this treatment “require[d] educators to provide early intervention, match instruction to the academic needs of the students, and monitor student progress with ongoing data-based decision making” (Vaughn et al., 2003, p. 392). The study consisted of 45 second-grade students who were regarded as at risk for reading impairments. Reading tutors were hired to work with approximately three students at a time, and tutors attempted to group all three students by the same reading ability levels (Vaughn et al., 2003). The intervention of focus tailored to the components of reading instruction generated by the NRP (2000) (Vaughn et al.,
Each treatment group participating in this study received 35 minutes of daily reading instruction in addition to general education core instructional methods (Vaughn et al., 2003). The targeted areas within this study consisted of fluency, phonemic awareness, instructional level reading, word analysis, and writing (Vaughn et al., 2003). Formal and informal methods of progress monitoring were conducted, where tutors incorporated daily logs, accuracy and speed of reading, record-keeping regarding evidence of words that students were unable to master independently, exercises in student word analysis dictations, and timed writing lessons (Vaughn et al., 2003). Following ten weeks of implementation of this intervention, all students were administered comprehensive assessments in reading (Vaughn et al., 2003). Selective students were able to exit early on account of their instructional progress during the implemented ten-week intervention (Vaughn et al., 2003). Supplementary instruction for 20 weeks allowed a mid-term exit upon proliferation of progress, and the final exit for students consisted of considerable progression in reading after 30 weeks of instruction (Vaughn et al., 2003). Vaughn et al. (2003) noted that students participating in all exit groups (i.e., early, mid, and late) surpassed students who did not participate in any exit groups, specifically on rapid naming. Thirty-four students were able to exit at different tiered points, while 11 students who participated in the study never exited (Vaughn et al., 2003). The major findings of this study stressed the importance of monitoring progress on a continual basis, particularly for struggling students, and provide further targeted interventions that are delivered outside of the general education classroom setting to increase student achievement (Vaughn et al., 2003).

Olinghouse, Lambert, and Compton (2006) examined the efficacy of two curriculum-based assessments, where progress monitoring procedures were prioritized to support systematic phonics
instruction. Olinghouse et al.’s (2006) study consisted of 40 children with diagnosed reading disabilities in second through fifth grade, where students resided in an urban, southeastern U.S. school district. The intervention employed consisted of the Phonological and Strategy Training Program (PHAST), which focused on remedial phonics-based instruction and strategic word identification methods that incorporated systematic, sequential, and direct instruction (Olinghouse et al., 2006). Following training, graduate research assistants implemented the study (Olinghouse et al., 2006). The instructional methods incorporated 60 lessons of the PHAST instruction (Olinghouse et al., 2006). Intervention groups comprised three to five students, and instructional sessions lasted approximately 70 hours (Olinghouse et al., 2006). The two progress monitoring assessments were used at six data points throughout this study and consisted of an oral reading fluency (ORF) subtest and an intervention aligned word list (IAWL) (Olinghouse et al., 2006). Based on the implementation of these assessments, implications for future research stressed the urgency to select appropriate instruments in progress monitoring that target the main goals of interventions implemented in accordance with the learning needs of the students (Olinghouse et al., 2006). Research has demonstrated that educators of special needs are required to justify powerful interventions that meet students’ individual learning needs, deducting that it is imperative for assessments to be valid and reliable in relation to student performance and progress (Vaughn et al., 2003). Olinghouse et al.’s (2006) study highlighted the need for progress monitoring strategies that support student learning.

Campbell et al. (2008) also examined the effects of progress monitoring. Students participating in Campbell et al.’s (2008) study received supplemental instruction for 10 to 12 minutes per day in this program. Daily progress monitoring measures included assessments in nonsense word fluency where miscues consisting of error analysis patterns were tracked with
regard to the level of word difficulties (Campbell et al., 2008). As procedures were monitored daily, the student in the subgroup identified with the most stable baseline received an additional multisensory component (Campbell et al., 2008). This multisensory component included high leveraged visual, auditory, and kinesthetic modalities (Campbell et al., 2008). Upon implementation of multisensory modalities, the experimenters developed specific performance criteria prior to moving into the phase of maintenance (Campbell et al., 2008). If students entered the maintenance phase, participants would no longer receive treatment in the Early Reading Tutor program (none of the students reached this phase) (Campbell et al., 2008).

Campbell et al. (2008) utilized treatment fidelity data to ensure that progress monitoring occurred at both the baseline and intervention phases of this study by employing checklists to examine implementation integrity. Although this study delineated specific limitations attributed to sample size, teacher knowledge of reading programs, and the condensed duration of this study, students demonstrated positive reading outcomes in nonsense word reading and oral reading fluency (Campbell et al., 2008). Furthermore, students achieved positive academic outcomes with the combination of multisensory elements in correlation to the implemented reading intervention (Campbell et al., 2008). Progress was monitored continually with the goal of using student data to inform further targeted instruction to meet the needs of students (Campbell et al., 2008). Consequently, this supplemental multisensory intervention improved student accuracy in word reading and furthered student acquisition of oral reading skill development (Campbell et al., 2008).

**Empirical Evidence Derived from Observational Studies**

Although empirical studies demonstrated successful achievement outcomes for students when multisensory, explicit, and systematic principles were used, Orton-Gillingham, Ritchey and Goeke (2006) affirmed that:
Despite widespread use by teachers in a variety of settings for more than 5 decades, OG instruction has yet to be comprehensively studied and reported in peer-refereed journals. The small number of existing studies lack methodological rigor that would be required for publication in current peer-referred journals (p. 182).

There continues to be a lack of research, which limits the ability to put programs in place for students with identified learning delays and impairments. Research regarding programs for dyslexia and education has maintained that “as of July, 2010, the US Department of Education has not been able to identify a single method or approach for dyslexia or learning disabilities that is supported by strong research” (Dyslegia, 2010, para. 1). Moreover, the U.S. Department of Education (2010) further highlighted the lack of present findings with regard to research-based multisensory programs due to the limited number of studies. Consequently, further empirical validation studies must be conducted to substantiate the value of specialized reading programs and approaches that support a multisensory, explicit, and systematic paradigm aimed to increase encoding and oral reading.

As revealed in the previous discussion of existing empirical studies, instruction should be multisensory, explicit, systematic, intensive, and administered by highly qualified professionals with a solid level of frequency, duration, and progress monitoring (Cullingham, 2013; McIntyre & Pickering, 1995; Moats & Joshi, 2012). This method, if well designed and implemented, will be effective in assisting primary level students with learning impairments in achieving increased gains in spelling and oral reading. This review has also identified intervening with these promising practices early as a critical element that is essential to the success of multisensory, explicit, systematic, and intensive phonics-based methods. Given the significant achievement gap in the subject areas of encoding and oral reading with the students who possess learning impairments at
the researcher’s workplace (an urban elementary school in Eastern Massachusetts), it is imperative that the researcher implement and evaluate the intervention of these promising literacy practices to this group of students. In addition, an intervention that encompasses a time span of 30 to 45 minutes of daily instruction and progress monitoring - two essential factors in implementing these instructional practices - will be carefully planned and designed into the intervention. This implementation will be discussed in detail in the data collection section of Chapter 3.

**Gaps in Literature**

Although positive gains in student achievement were noted for the studies reviewed (Campbell et al., 2008; Ehri et al., 2001; Hintze, 2009; Hook et al., 2001; Joshi et al., 2002; Krafnick et al., 2011; Oakland et al., 1998; Olinghouse et al., 2006; Shaywitz et al., 2004; Vaughn, 2003; Wilson & O’Connor, 1995), gaps remain in the literature. The most significant gap was that previous studies were not representative of only students with learning disadvantages and learning delays. These scores resulted in inconsistent measures given that the population of students observed did not solely possess learning disabilities and learning impairments, rendering the overall results questionable. Additionally, the studies that employed a multisensory intervention approach lacked the description of structured dialogue used in multisensory teaching methods between students and teachers. Guidance and feedback from teachers to students are two critical components to foster interactions and ensure that multisensory, explicit, and systematic practices are presented in a meaningful manner in order for students to retain information to memory (International Dyslexia Association, 2000). The proposed study will implement these critical elements to promote independent practice of skills taught and ample opportunities for feedback that warrant students’ understanding of the spelling and oral reading concepts taught.

The extent and quality to which the fidelity of implementation occurred among previous
studies is also unknown. This gap will be fulfilled in the present research study by incorporating a progress monitoring template that will be filled out on a weekly basis with a focus on skills targeted in the areas of encoding and oral reading for each student participating in this research design. This template will be used as a framework to measure how the delivery of instruction was incorporated within this study.

As the elements of the NRP (2000) have become increasingly critical to prevent reading failure, previous studies conducted did not specifically address the alignment between multisensory, explicit, and systematic instructional practices and recommendations cited by the NRP (2000), with the exception of the meta-analysis study by the panel. This study will safeguard targeted instructional practices for each reading pillar to ensure that multisensory, explicit, and systematic practices align with “phonics, phonemic awareness, fluency, vocabulary, and comprehension” (as cited in Reading Horizons, 2014, pp. 1-5). The alignment between multisensory, explicit, and systematic practices and the NRP (2000) is a critical consideration within teaching methodologies grounded in reading research (Birsh, 2005). Therefore, this is a gap that will be focused on extensively within this proposed problem of practice.

The empirical studies investigated were also not specific about the type of resources used in the multisensory matrix to improve academic performance with regard to specific content and principles of instruction. A lesson plan matrix and instructional log will be used in this study, delineating specific procedures (e.g., tapping or blending sounds in words, generating keywords for individual phonemes, simultaneous oral spelling practice, and specialized fluency-building exercises with syllable cards). These procedures will be clearly defined in the implementation of specific instructional practices to ensure that both principles and content are being adhered to with fidelity, and that the specific scope and sequence of specialized literacy programs are conveyed by
Supplementary gaps included the fact that certain studies focused on solely one program or approach (e.g., Hwee & Houghton, 2011; Krafnick et al., 2011; Olinghouse et al., 2006; Wilson & O’Connor, 1995). Studies that embedded alternative procedures implemented one to two instructional methodologies (e.g., Campbell et al., 2008; Joshi et al., 2002; Scheffel et al., 2008). Because the following programs specifically targeted only one to two specialized reading programs or approaches in the empirical studies, elements from Orton, Wilson, Lindamood-Bell, and Project Read will be implemented in this intervention. The rationale for utilizing all four practices is based on research from Dyslegia (2010), which posited the inefficacy of executing one program or approach. Thus, the objective is to integrate multisensory, explicit, and systematic practices from all programs and approaches in an effort to observe the efficacy of embedding components from various research-based reading programs and approaches that support an instructional paradigm grounded in these practices. The ultimate goal upon implementation of these practices is to foster student achievement across the curriculum areas of encoding and oral reading.

**Conclusion**

Since the end of the 19th century, multisensory, explicit, and systematic practices have played a critical role in the process of literacy acquisition skills. As increasingly rigorous demands have been placed on students by comprehensive state requirements enacted by the NCLB (2001) and the CCSS (2010) in alignment with IDEA (2004), 21st century education skills stipulate that students develop foundational and proficient literacy skills required by third grade (Torgeson, 2006). Paramount consideration must be given to students with special needs because they are exclusively the highest-needs category and at an accelerated risk for being left behind (President’s
Areas for further investigation are needed based on multisensory practices (Dyslegia, 2010; Ritchey & Goeke, 2006). Empirical studies conducted on these methods found improved scores following the implementation of interventions with regards to programs and approaches which supported a specialized paradigm centered on research-based programs that embedded specialized instructional practices (Campbell et al., 2008; Ehri, Nunes, Stahl, & Willows, 2001; Hickman et al., 2003; Hintze, 2009; Hwee & Houghton, 2011; Hook et al., 2001; Joshi et al., 2002; Krafnick et al., 2011; Oakland et al., 1998; Olinghouse et al., 2006; Shaywitz et al., 2004; Wilson & O’Connor, 1995). Although empirical studies have shown increased student achievement across literacy, the lack of studies conducted has raised concerns regarding the efficacy of these methods (Dyslegia, 2010; Ritchey & Goeke, 2006). Hence, further exploration is needed to substantiate the value of a framework that embodies a paradigm grounded on research-based practices.

The purpose of an additional, targeted study informed by this literature review will be to examine the impact that multisensory, explicit, and systematic methods of instruction have on student achievement in the areas of encoding and oral reading, specifically targeted to students with learning impairments. This research design will discern if multisensory, explicit, and systematic practices are practical and will justify why these methods should be utilized for students who exhibit learning impairments. Although considerable research has been conducted to this date regarding the impact of multisensory methods, explicit instruction, and systematic practices, further research is needed to validate the rationale as to why these methods of instruction have been most successful for students with identified learning needs, specifically in the area of literacy. Further studies of multisensory, explicit, and systematic practices, with a concentration on students with learning impairments, can be used to inform future practices aimed at incorporating an
instructional framework to narrow the achievement gap with students who possess learning deficits.
Chapter 3: Methodology

The purpose of this chapter is to present and justify the methodology to be used to address the research questions in this study. Specifically, this chapter discusses in detail the plan for sampling strategy, data collection, and data analysis. In addition, issues and corresponding strategies relating to the validity, reliability, and generalizability of the study will be explored, along with those regarding the protection of human subjects. This chapter will start by recounting the purpose and specific research question to be addressed in this study.

Research Question

Are specialized, instructional approaches that are multisensory, explicit, and systematic effective for students who exhibit learning impairments in the areas of encoding and oral reading?

Research Hypothesis

Given the central research question, the research hypothesis was: Students in grade 2 with diagnosed learning impairments who are taught with multisensory, explicit, and systematic teaching practices will show significant improvement in literacy within the subject areas of encoding and oral reading.

Null Hypothesis

Based on the central research question and research hypothesis, the null hypothesis was: Students in grade 2 with diagnosed learning impairments who are taught with multisensory, explicit, and systematic teaching practices will not show significant improvement in literacy within the subject areas of encoding and oral reading.
Research Design

The study utilized a single-subject research design - an experimental design often used in intervention studies. Fraenkel, Wallen, and Hyun (2011) noted that single-subject designs “are most commonly used to study the changes in behavior an individual exhibits after exposure to an intervention or treatment of some sort” (p. 302). Single-subject research designs are particularly useful in the field of special education (Cook & Odom, 2013). Most special education interventions are individualized, and the use of a single-subject design allows the researcher to examine specialized practices that work best for individual or small groups of students with learning impairments (Cook & Odom, 2013; Tankersley, Harjusola-Webb, & Landrum, 2008).

In a single-subject experimental study, participant variability is a circumstance that should be considered to this single-subject research design (Cook et al., 2013). This factor was based on the design’s intricacy, since, by design, it influences an overrepresentation of student attributes, such as the extensive disability categories identified by IDEA (2004) and the educational context of special education that can impact study results (Cook et al., 2013). To address this complex factor, only students with specified learning impediments and delays in spelling and reading were focused on throughout this study. This component of the single-subject research design was also a disadvantage. The limited number of subjects studied did not allow for generalizations of study results to other samples or populations (Fraenkel et al., 2011). Nevertheless, truly effective interventions should demonstrate their efficacy in multiple applications (Fraenkel et al., 2011). Therefore, this study helped to determine the most effective instructional practices to utilize for students with learning impediments for future research implications.

Research site and target population. The site of this study was a K–5 elementary school in Eastern Massachusetts, and the target population consisted of three second-grade students with
spelling and reading impairments. The elementary school was geographically located in an urban community and served a student body from diverse socioeconomic backgrounds. As of demographic data obtained in January 2015 from the student information system at the school where the study took place, the number of students attending this elementary school is 255, with 26.67% African-American, 18.82% Asian descent, and 47.06% Caucasian descent. The school leadership includes one principal and one vice principal.

With regard to second grade, there are two general education second grade teachers and two classrooms. The second-grade class student body for the 2014-2015 school year is comprised of 28 students. In order for subjects to qualify for this study, students must have been (a) second-grade students at the elementary school; (b) received instruction within a self-contained classroom with a general educator teaching the core curriculum; (c) had documented learning impairments in literacy as identified through Individualized Educational Programs (IEPs); and (d) had started their IEP program of study concurrent with the implementation of the study. In this study, the student participants had been identified through IEPs to receive specialized services in reading and spelling (encoding). Student participants who were selected exhibited learning deficits in the specific academic disciplines of encoding and oral reading.

The Special Education Team, which included the special educator, school psychologist, speech and language pathologist, school counselor, physical therapist, and occupational therapist, had implemented a full comprehensive assessment and students had met the eligibility criteria to qualify for IEPs, indicating that students were performing below grade and age-level standards across content disciplines. Moreover, the three students involved in this study required remedial support through alternative methods of instruction outside the classroom setting to access the literacy content of the general core curriculum effectively. Consequently, the subjects of study
required specially designed methods of instruction to access the curriculum content and maintain the instructional pace of the generalized curriculum.

With over thirteen years of experience as a special educator and extensive knowledge of multisensory, explicit, and systematic instructional practices, the researcher was uniquely qualified to select three similarly learning impaired students to participate in this study. Since the participants being studied possessed significant learning impairments in literacy, the sample was considered one of convenience. As noted previously, this sampling method may not be desirable, although it was necessary because a random sample of second-grade students was not possible or ethical contingent on the targeted subjects within this study.

Data Collection Instruments

The two dependent variables, oral reading and spelling (encoding), for this study were measured by two assessment instruments, the Comprehensive Test of Phonological Processing (CTOPP-2) and the spelling subtest of the Word Identification and Spelling Test (WIST; Wilson & Felton, 2004). The CTOPP-2 was used to evaluate oral reading skills. The WIST incorporated a reading and spelling component, although the primary assessment used consisted of the spelling subtest.

IDEA (2004) has mandated that assessments used to collect student achievement data must adhere to “technically sound instruments” (para 6) that demonstrate sound reliability and validity, are implemented by highly qualified professionals in the specific achievement domain, and are effective in assessing student achievement as they pertain to academic domains. In the school district where the study took place, school administrators have always required that special education achievement assessments, in support of special education laws, be administered by
educational professionals who are highly trained, adept, and qualified to administer all comprehensive assessments endorsed in this research design.

**Comprehensive Test of Phonological Processing-second edition (CTOPP-2).** The CTOPP-2 (Wagner, Torgesen, Naglieri, & Goldstein, 1999; Wagner, Torgesen, Rashotte, & Pearson, 2013) was used to measure the dependent variable of oral reading. The CTOPP-2 is a standardized test used to measure reading-related phonological processing skills in children and young adults from 6 to 24 years of age. In 2008 and 2009, the CTOPP-2 was re-normed from new data from a representative sample of 1,900 students, ages 6 to 24 years of age, in the United States (Wagner et al., 2013). The CTOPP-2 has four principal uses: (a) to identify students who are lagging behind their peers with regard to phonological abilities, (b) to assess students’ phonological processing strengths and weaknesses, (c) to document increases in phonological processing skills among students participating in reading interventions, and (d) as a research tool in studies examining oral reading skills in children and young adults (Wagner et al., 2013).

The CTOPP-2 measured students’ abilities in reading-related phonological processing skills. These processing skills are generally measured via 12 subtests across four phonological domains: (a) phonological awareness, (b) phonological memory, (c) rapid naming, and (d) alternate phonological awareness (see Table 3; Wagner et al., 2013). Subtests administered in this study consisted of Elision, Blending Words, Phoneme Isolation, Blending Nonwords, and Segmenting Nonwords. The justification for utilizing this assessment was to identify specific deficiencies in particular domains of phonological processing directed towards determining the appropriate multisensory, explicit, and systematic practices to utilize with students who possess oral reading deficits.
Table 4

CTOPP-2 Subtests and Composites Used in this Study for Students (Bolded & Shaded in Gray)

<table>
<thead>
<tr>
<th>Core Subtests</th>
<th>Phonological Awareness</th>
<th>Phonological Memory</th>
<th>Rapid Symbolic Naming</th>
<th>Alternate Phonological Awareness</th>
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<td>Elision</td>
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<td>Blending Words</td>
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<td>Phoneme Isolation</td>
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<td>Memory for Digits</td>
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<td>Nonword Repetition</td>
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<td>Rapid Digit Naming</td>
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<td>Rapid Letter Naming</td>
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<td>Supplemental Subtests</td>
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<td>Blending Nonwords</td>
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<td>Segmenting Nonwords</td>
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The coding of the CTOPP-2 oral reading data converts raw scores to composite scores, developmental scores, age equivalents, and grade equivalents. In this study, the composite scores was used. Sample test items that were administered included:

- Say “cup.” Now say “cup” without saying /k/.
- What is the third sound in the word music?
- What word do these sounds make? m-oo-n.
- Say ep.
• You will hear some made-up words in small parts, one part at a time. I want you to listen carefully and then put these parts together to make a made-up word. The word is *sh-i-b*.

The CTOPP-2 is one of the most utilized reading assessment tests, especially in samples of children with reading deficits (Masso, Baker, McLeod, & McCormack, 2014; Sjerps & Simon, 2009; Wagner et al., 2013; Wagner, Torgesen, Naglieri, & Goldstein, 2009). The inter-item reliability of the CTOPP-2 subtests and composite scores have been examined in studies (e.g., Masso et al., 2014; Sjerps & Simon, 2009; Wagner et al., 2009, 2013). Reliability for subtests surpassed Cronbach’s alphas of .80 (with the exception of the Nonword Repetition subtest at .77), and the mean internal consistency coefficients indicated a reliability level of .85 (Masso et al., 2014; Sjerps & Simon, 2009; Wagner et al., 2009, 2013). Validity studies demonstrated that mean correlation coefficients between CTOPP-2 subtests and measures of oral reading (e.g., DIBELS, Qualitative Reading Inventory) varied from $r_s$ of .49 to .84, $p < .05$, while mean correlation coefficients between CTOPP-2 composite scores and measures of oral reading (Oral Reading Fluency Scale, DIBELS) ranged from $r_s$ of .65 to .76, $p < .05$ (Masso et al., 2014; Sjerps & Simon, 2009; Wagner et al., 2009, 2013).

**Spelling subscale of the Word Identification and Spelling Test (WIST).** The spelling subtest of the WIST (Wilson & Felton, 2005) was used to measure the dependent variable of spelling (encoding). The WIST is a standardized reading assessment test that was normed using a sample of 1,520 children, ages 7 to 18 years and 11 months, from 16 states (Wilson & Felton, 2005). The WIST contains two subtests that measure (a) reading skills and (b) spelling skills. In this study, only the spelling subscale of the WIST was used. The purpose of the WIST spelling
subtest was to measure subjects’ achievement in spelling (encoding). The spelling subtest measures:

Students’ ability to spell words correctly from dictation. Specifically measures students’ (a) recall of correct letter sequences for familiar words or one’s ability to apply sound/symbol relationships and rules of English orthography in order to spell unfamiliar words and (b) their recall of letter order in high-frequency words with one or more irregularities. (Pro-Ed/Word Identification and Spelling Test, 2004, para 5).

The subtest was targeted for children ages 7 years to 18 years and 11 months. Additionally, the spelling subtest had a testing duration of approximately 20 minutes. Sample test items included the following: (a) “The sun is bright” (dictated), spell sun; (b) “He fished in all the lakes” (dictated), spell lakes; and (c) “We completed one hundred problems” (dictated), spell hundred. Some of the words with irregular spelling that the students were asked to spell were into, they, only, could, thought, and from. The coding of the WIST spelling test data involved the converting of raw scores to standard scores, percentile ranks, age equivalents, and grade equivalents. In this study, the standard scores were used.

The WIST spelling subtest has been utilized frequently in reading achievement research studies (Torgerson, Brooks, & Hall, 2006), especially in studies conducted for students with dyslexia (Reid, 2013; Singleton, 2009; Zaretsky & Velleman, 2011). Alpha coefficients for test-retest reliability for the elementary version (second through fifth grade) spelling subtest have ranged in the low to high .90s (Reid, 2013; Torgerson et al., 2006; Wilson & Felton, 2005). Criterion-prediction validity, content-description validity, and construct-identification validity studies were conducted, indicating a high degree of validity with measures of spelling (Reid, 2013; Torgerson et al., 2006; Wilson & Felton, 2005; Zaretsky & Velleman, 2011).
Procedures

This study was conducted over a period of two months, which included both the baseline and intervention phases. The baseline phase lasted for three weeks. During these baseline weeks, the CTOPP-2 (Wagner et al., 1999, 2013) was administered to measure the dependent variable of oral reading, and the spelling subtest of the WIST (Wilson & Felton, 2005) was used to measure the dependent variable of spelling (encoding). Both tests were administered to the children five times over the three-week duration (Monday-Friday throughout each week). The students completed the CTOPP-2 and the spelling subtest of the WIST. Testing time was approximately a total of 60 minutes for both assessments.

Following the baseline phase, the treatment intervention was implemented to the subjects five days per week for 45 minutes at a time, over a time span of five weeks. As such, the students were instructed for a total of 25 sessions of the intervention. The students completed the CTOPP-2 and the spelling subtest of the WIST at the end of the first, second, third, fourth, and fifth week of the intervention. The intervention data collection procedure was implemented in the same way as the procedure administered for the baseline data collection.

**Treatment phase methodology.** The process and procedures with regard to multisensory, explicit, and systematic treatment interventions incorporated specific instructional activities. These activities included: (a) the use of phonogram cards, (b) systematic and explicit instructional techniques involving sound segmentation and blending activities, (c) phonetically-controlled text reading, and (d) structured spelling dictations through a simultaneous oral spelling method. In accordance with the recommendations from the CCSS (2010), the use of technology was integrated into the intervention to augment supplemental instructional practices. The instructional practices and use of technology are discussed in the following sections.
Phonogram cards. Each day throughout the week, the instructor and students practiced phonogram cards, which consisted of phonemes on cards (e.g. a, oa, ar, oo). The goal of this instructional practice was for the students to identify the letter, corresponding sound, and key words correctly. For example, the students would be asked to (a) identify the letter a, (b) produce the sound that corresponds to the letter a, and (c) correctly match the letter a to a key word, such as apple. This activity allowed the students to make the link between the multisensory modalities (i.e., visual to auditory) that are involved in the oral reading process.

Systematic and explicit instructional techniques. For each intervention session, the teacher utilized various systematic and explicit instructional techniques. These included working with students using sound cards and word cards to develop larger syllable units; the use of reading word lists and syllable cards augmented this activity. Students were also given magnetic journals with phonogram tiles, which were used as a tool to help students identify a specific phonogram and its sound. Sentence lists that students were required to read focused on a single set of skills at a time for both reading and spelling (e.g., closed syllables, silent e words, r-controlled syllable type). Explicit instructional techniques where students were asked to perform specialized techniques known as finger tapping, blending phonemes, segmenting sounds, scooping syllables, and skywriting words were incorporated into the daily routine lessons as well.

Phonetically-controlled text reading. Students were asked to read a short story or passage on a daily basis that was phonetically-controlled (i.e., focused on the skill being taught, such as short vowel sounds, consonant blends, vowel teams, and/or r-controlled syllable types), in accordance with the appropriate skill (closed syllable, vowel teams, silent e syllable type, etc.) being taught that day. This method gave students a multisensory learning opportunity to apply a
visual (i.e., reading words in print) to auditory connection (i.e., reading words aloud) of words in print.

**Structured spelling dictations via simultaneous oral spelling method.** Students were given a series of sounds, words, and sentences nearly every day. In order to reinforce the technique called *simultaneous oral spelling*, students were expected to (a) repeat the sound or word back to the teacher, (b) name the letter or letters in the sound and/or word, and (c) incorporate a technique known as *say and spell* (i.e., state each letter of the sound or word as it was written) as they recorded each letter of the sound and/or word. This was a multisensory learning procedure, as it involved the integration of listening skills with the tactile modality of writing. Once students progressed towards writing sentences, the goal was for students to apply the skills they had learned with regard to understanding sounds within words and sentences. Structured dictations involved spelling sounds, real words, and sentences. Students were expected to complete sentences independently, given prior guided practice of the necessary skills and strategies needed to transition to independent spelling practice. The culminating activity of each spelling dictation consisted of the transition from guided practice in spelling to the students’ mastery of spelling skills through the completion of applying words taught to independent sentence writing.

**Integration of technology.** All lessons were reinforced weekly through a software program entitled *Lexia*. This software program is designed for students from age 4 through adulthood. The recommended program for this population of students consisted of Primary Reading (ages 5–8). The utilization of this technology program strengthened students’ knowledge in the acquisition of words and word sounds, fundamental literacy skills, word recognition, encoding, and vocabulary (Lexia Learning, 2012). Students were able to practice their oral reading and spelling (encoding) skills through activities which supported multisensory, explicit, and systematic practices.
Extraneous Variables

Extraneous variables can influence the internal validity of a single-subject research study (Kratochwill et al., 2010). Internal validity pertains to the extent that systematic variance in a study is reduced so that causal conclusions of study findings can be confirmed (Campbell & Stanley, 1966). The threats to internal validity which exist in single-subject research designs include (a) lack of random assignment, (b) participant maturation, and (c) participant attrition. Because random assignment was not feasible for this study, it posed a threat to the internal validity of this study. Therefore, the researcher implemented recommended methodology procedures shown to reduce this threat (Kazdin, 1982; Kratochwill et al., 2010). First, the researcher utilized assessment tools shown to be reliable and valid to measure baseline to intervention changes in students’ oral reading and spelling skills. Second, the researcher implemented the intervention sequentially (i.e., immediately following the baseline period) so that additional plausible explanations for changes in students’ skills could be ruled out (Campbell & Stanley, 1966; Kazdin, 1982). The sequential implementation of the intervention also helped to reduce the threat of ambiguous temporal precedence (Kazdin, 1982; Kratochwill et al., 2010). As the internal validity of the single-subject research study “can be improved through replication,” the researcher recorded the treatment so this study could be replicated by other researchers (Kratochwill et al., 2010, p. 4).

In this study, maturation was a potential threat to validity. Children ages one through three years of age show immense cognitive growth, even over periods of time as short as one month (Siegler, 2013). Fraenkel et al. (2011) noted that the maturation threat is most prevalent in research studies involving pre-post data for the treatment group. To alleviate this threat, the researcher utilized the CTOPP-2 (Wagner et al., 1999, 2013) and WIST (Wilson & Felton, 2005).
assessments, both of which consider the developmental age of the child (i.e., in years and months) and provide composite and standard scores based on age equivalents.

An additional threat to the internal validity of this study was attrition; this was especially a concern due to the small sample size. The researcher helped to minimize the attrition threat by monitoring attrition during baseline and intervention phases, and was prepared to document any issues that emerged with regard to participation. Fortunately, this was not a potential threat in the implemented study that consisted of these three students.

Extraneous variables can also influence the external validity of a study. External validity can be defined as the generalizability of study results to other samples, settings, and time periods (Campbell & Stanley, 1966). As single-subject research studies tend to examine the effectiveness of a specific intervention on enhancing specific outcomes in a specific sample, these studies “are weak when it comes to external validity” (Fraenkel et al., 2011, p. 314). According to Birnbrauer (1981), the external validity of a single-subject research study is best enhanced via “systematic replication of effects across multiple studies” (as cited in Horner et al., 2005, p. 171). While the researcher must rely on replications to ensure the merit with regard to the generalization of findings, she included multiple participants and measured two types of literacy skills (i.e., oral reading and spelling), as these factors have been shown to enhance the external validity of single-subject research studies (Horner et al., 2005; Kazdin, 1982).

**Measures of Treatment Fidelity**

Treatment fidelity was an integral component of this single-subject study. In order to ensure that the treatment intervention was being implemented with fidelity, direct measures and indirect measures were incorporated into this study to conform to the standards required in treatment integrity (Fuchs, Fuchs, Yazdian, & Powell, 2002; Gable, Hendrickson, & Van Acker,
2001; Gresham, MacMillan, Beebe-Frankenberger, & Bocian, 2000; Lane, Bocian, MacMillan, & Gresham, 2004; Sheridan, Swanger-Gagne, Welch, Kwon, & Garbacz, 2009; Telzrow & Beebe, 2002). Given that direct measures require methodical observations of behavior, the researcher incorporated a log of lesson structures (Gable et al., 2001; Gresham et al., 2000; Lane et al., 2004). The indirect measure embedded a checklist, where the researcher and special educator implementing the study was required to check off exactly what skills were targeted each week of implementation. This checklist also incorporated a progress monitoring sheet of phonograms (short vowel and corresponding sounds, consonant digraphs, vowel teams, etc.) and specific spelling rules or generalizations (distinguishing between letters that make up short vowels, consonant blends, and vowel teams). Consequently, these measures allowed the researcher to generate informed decisions about treatment effects relative to the extent of academic learning outcomes achieved.

Data Analysis

Preparation of the data file. Data was collected from the CTOPP-2 (Wagner et al., 1999, 2013) and the WIST (Wilson & Felton, 2005) at the baseline and treatment phase of this intervention. The collection of data at multiple time points during the baseline and intervention phases required a system that ensured information was correctly matched to the student data collection (Saris & Gallhofer, 2007; Wiles, Crow, Heath, & Charles, 2008). During the course of the intervention, the researcher utilized progress monitoring assessments that documented student and intervention information (e.g., phonogram checklist, instructional monitoring log). In order to ensure that baseline and intervention data were collected and recorded accurately for each child while maintaining the child’s confidentiality and anonymity, the researcher assigned students participating in this study a seven-digit student identification number (Wiles et al., 2008). She
secured the assignment sheet that contained the student’s name and assigned identification number in a locked file cabinet in her school office separate from the collected past reports and confidential student documents (kept in a separate locked file cabinet in her office).

Upon student completion of both the baseline and treatment assessments, the researcher scored the assessments and input assessment data into an SPSS 22.0 data file. The researcher kept the SPSS data file on a password protected jump drive, which she secured in a locked file cabinet that was kept separate from the assignment sheet and progress monitoring reports. Both paper and digital information of the implemented study will be kept secured in locked file cabinets in the researcher’s work office for three years, after which it will be destroyed (e.g., papers shredded, data files deleted).

**Type of single-subject research design.** The researcher collected baseline data from students five times across three weeks, at equally spaced times with three students. Figure 3 provided a graphic analysis example of the concurrent design from one hypothetical student, documenting the student’s CTOPP-2 score.

![Figure 3](image-url)
**Visual data analysis method.** Visual analysis is the preferred data analysis method for single-subject designs (Brossart, Parker, Olson, & Mahadevan, 2006; Kazdin, 1982; Kennedy, 2005; Tankersley, Harjusola-Webb, & Landrum, 2008). Visual analysis refers to reaching a research decision via the use of “systematic rules for evaluating a graphic representation” of continuously-coded data collected at baseline and intervention phases (Tankersley et al., 2008, p. 87). In his seminal work, Kazdin (1982) defined visual analysis “as the process for reaching a judgment about reliable or consistent intervention effects by visually examining graphed data” (as cited in Brossart, et. al, 2006, p. 531).

The examination of graphed data provided support for or against a functional (or causal) relationship between the intervention and students’ oral reading and spelling skills (Kazdin, 1982; Kennedy, 2005; Tankersley et al., 2008). Following the recommendations of Brossart et al. (2006), the researcher used graphed data not “to predict the size of significance” of the intervention but instead to “judge graphs according to their own criteria of practical importance, effect, or impact” (p. 536).

The visual analysis of data entailed the examination of graphic data elements at (a) baseline and intervention phases and (b) within and between groups (Kazdin, 1982; Tankersley et al., 2008). In single-subject research designs, graphed data contains five elements pertinent to interpretation of visual analysis: (a) level, (b) trend, (c) variability, (d) latency of change, and (e) data overlap (Kazdin, 1982; Kennedy, 2005). These elements are discussed in the following sections.

**Level.** The first element examined and interpreted at both the baseline and intervention phases and within and between groups is the level. The level exemplified the data average that “is typically calculated as the mean or median” (Kennedy, 2005, p. 197). Figure 4 provides an
example of a graphic representation of the mean score for the baseline and intervention phases. For the baseline phase, the mean CTOPP-2 score was 52.2; for the intervention phase, the mean CTOPP-2 score was 82.3. These scores were graphed over the single data points as black lines in Figure 4. These lines provide a graphic display of the level or mean score. In this study, the researcher was able to observe pattern comparisons between the baseline and intervention phases to speculate if an experimental effect occurred.

![Graphic representation of the mean score](image)

*Figure 4. Graphic representation of the mean.*

Kennedy (2005) posited that the last three major data points consisted of the most significant level of information prior to changes in phases. In this research study, while all data points were used to comprise the level or mean, the last three data points were examined in detail given that they were the most critical points throughout an intervention study (Kennedy, 2005).

**Trend.** The second pertinent element in the visual analysis is the trend of the data. The trend in visual analysis refers to “the rate of increase or decrease of the best-fit straight line for the dependent variable” (Horner et al., 2005, p. 171). Two significant components that need to be examined in trends are the slope (i.e., the best-fit straight line) and the magnitude (i.e., the degree
of slope increase or decrease). These changes allowed the researcher to determine if trends were ascending or descending over time (Tankersley et al., 2008).

Figure 5 provides an example of a graphic representation of the slope and magnitude for the baseline and intervention phases. The black lines over the baseline and intervention data points denote the slope and magnitude for both phases. The slope increased over the baseline phase; the magnitude of the slope, however, was small. While the scores were higher at the intervention phase, the slope decreased over the intervention phase. In this study, the researcher was able to observe pattern comparisons between the baseline and intervention phases to speculate whether or not an experimental effect occurred.

![Figure 5. Graphic representation of the slope and magnitude.](image)

In this study, the researcher observed changes in baseline and intervention slopes and magnitudes to determine intervention effectiveness (Horner et al., 2005; Tankersley et al., 2008). The researcher specifically observed descending baseline trends followed by ascending intervention trends, as this would be suggestive of a functional relationship between the dependent and independent variables (Horner et al., 2005; Tankersley et al., 2008).
**Variability.** Variability is the third element used to evaluate within and between-phase patterns (Kazdin, 1982; Kennedy, 2005; Tankersley et al., 2008). Variability is described as the magnitude to which independent data points digress in relation to the line of best fit; in other words, variability is the fluctuation of scores around a mean or slope (Kazdin, 1982; Kennedy, 2005). Variability in scores can range from low to high (Kazdin, 1982; Kennedy, 2005). The higher the degree of data variability, the more points of data that are needed to verify a pattern of consistency (Kennedy, 2005; Tankersley et al., 2008). Parsonson and Baer (1978) concluded that diminished variability in the treatment stage is demonstrative of control. The researcher incorporated five data points within the baseline and treatment phase to ensure that adequate data variability points were plotted in the graphing matrix. Variability in this study observed the range of daily percentages in oral reading and spelling (lowest to highest in both subject areas), as well as the variation of the data (periodically measured as standard deviation regarding the mean).

**Immediacy of effect.** A major feature in visual analysis within participants is the immediacy of effect, also known as the latency of change (Horner et al., 2005; Kazdin, 1982; Kennedy, 2005; Tankersley et al., 2008). Kennedy (2005) defined immediacy of effect as “how quickly a change in the data pattern is produced after the phase change” (p. 203). According to Tankersley et al. (2008), a change in the dependent variable within a shorter time frame provides support of intervention effectiveness. The stronger the immediacy of effect, the shorter the duration of the phase, indicating a greater degree that would be suggestive of a functional relationship between multisensory, explicit, and systematic instructional practices on oral reading and spelling achievement (Kennedy, 2005). The researcher observed the acceleration of the effect after employing the intervention following the baseline conditions in an effort to observe what the immediacy of the effect resembled from the onset of one condition to the next. In this study, the
goal was to produce a rapid immediacy of effect because the instructional phase was briefer and proved the effect of the employed intervention.

*Data overlap.* The data overlap was observed in this study to examine if the data points were high or low, and this overlap was compared in adjacent phases. The larger the overlap, the less influential the effect (Kratochwill, Horner, & Ferron, n.d.). The greater the proportion of non-overlap in the data, the more desirable the effect. Overlap of data is most relevant when there is very little trend in the data, and the value of overlap is weighted less when there is trend in this data (Kratochwill, Horner, & Ferron, n.d.). In this research study, overlap of data was analyzed through five data points in both oral reading and spelling between the baseline and intervention phases since overlapping of data demands more data points in an intervention. The researcher was able to discern the degree of overlap in this study by examining the data overlap, with an understanding that the more significant the effect of treatment, the less overlap of data will be demonstrated (Parsonson & Baer, 1978).

*Choice of statistical technique.* Given that this research design was single subject and the researcher speculated whether or not a functional relationship existed between multisensory, explicit, and systematic practices and student achievement, the statistical technique utilized in this study was a visual analysis method. Huitema (1986) maintained that experts argue visual analysis results in “low error rates” (as cited in Brossart et al., 2006, p. 3), and Baer (1977) claimed that this method is “conservative in identifying treatment effects” (as cited in Brossart et al., 2006, p. 3). This system of examining graphic data is a compelling way of uncovering whether or not a functional relationship exists (Hacking, 1983; Smith, Best, Stubbs, Archibald, & Roberson-Nay, 2002). Additionally, it is one of the most standard research designs in single-case research because it is designed to state whether or not the intervention has been successful, as well as to determine
the strength and magnitude of the intervention (Horner et al., 2005). Furthermore, this method allowed the researcher to examine treatment effects and the meaningfulness of the graphic data displayed (Ottenbacher, 1986). Through this method, the researcher was able to observe specific patterns by visual inspection and draw interpretations based on data representations (Kennedy, 2005). Ultimately, visual representations were utilized in this study by virtue of generating informed instructional decisions and tailoring specific procedures of teaching methods embedded in this study.

**Validity, Reliability, and Generalizability**

**Validity.** Fraenkel et al. (2011) asserted that single-subject research studies can pose numerous threats to the internal and external validity of a study. Specific threats to internal and external validity within this research study have been addressed in the section entitled *Extraneous Variables*. In that section, the researcher has provided a comprehensive discussion of how internal and external validity issues of concern to this study were addressed. The quality of a research study is also very much influenced by the validity of the testing instruments used to measure study constructs (Cook & Beckman, 2006; Gall, Gall, & Borg, 2007). The data collection process encompassed the use of instruments and measurement procedures that helped to enhance the internal and external validity of the study. With regard to testing instruments, instrument validity refers to “the appropriateness, meaningfulness, and usefulness of specific inferences made from test scores” (Gall et al., 2007, p. 657).

Researchers have posited that three types of validity pertain to instruments. An assessment tool must have *content validity*, also known as face validity: “the instrument looks, on the face of it, as if it measures the construct of interest” (DeVon et al., 2007, p. 157). *Construct validity* is defined as the degree to which an instrument best captures the theoretical construct(s) that it is
designed to measure (DeVon et al., 2007; Gall et al., 2007). Factor analyses are often employed to determine the construct validity of an instrument (Devon et al., 2007). Another type of instrument validity is criterion-related validity, which is the relationship between “the attributes in a measurement tool with its performance on some other variable,” whether the variable is being measured by another instrument or by an observed behavior (DeVon et al., 2007, p. 156). Criterion-related validity can be either concurrent (i.e., the instrument is correlated to another instrument or a behavior at the same point in time) or predictive (i.e., the instrument is used to predict later behavior; DeVon et al., 2007; Gall et al., 2007). As the effects of instructional methods on two specific literacy skills - oral reading and spelling - were assessed in this research study, the instruments’ content, construct, and criterion-related validity were of particular significance (Gall et al., 2007).

**Validity: WIST.** The WIST has a ten-year history of use in school settings as an assessment tool to determine students’ encoding skills and resultant student placement in reading interventions (Langenberg, 2013; Wilson & Felton, 2004). The WIST has demonstrated content validity via its alignment to the CCSS in reading, and it has been an effective tool for assessing changes in students’ spelling skills as a result of participation in reading interventions (see Langenberg, 2013, for a review of reading intervention evaluations). CFA analyses have shown that the WIST is best structured as a two-factor instrument, with CFIs in the low .90s (Wilson & Felton, 2004). The WIST has shown strong concurrent criterion-related validity via its ability to distinguish between students with and without encoding deficits, especially as they pertain to dyslexia (Reid, 2009; Wilson & Felton, 2004; Zaretsky & Velleman, 2011). Concurrent criterion-related validity of the WIST has also been documented via its significant correlations with other spelling assessments, such as the Wilson Assessment for Decoding and Encoding (WADE) and the
Primary Spelling Inventory (PSI) (Reid, 2009; Wilson & Felton, 2004; Zaretsky & Velleman, 2011).

**Validity: CTOPP-2.** The CTOPP-2 assessment tool has demonstrated sound content, construct, and concurrent criterion-related validity as determined by a 15-year history of documented research (Wagner et al., 2013). The content validity of the CTOPP-2 has been supported via its alignment with CCSS for reading (Wagner et al., 2013). The construct validity of the CTOPP-2 was determined via confirmatory factor analyses (CFA; Wagner et al., 1999). Results from the CFA showed that the comparative fit index (CFI) was .99 and furthermore, that all factor loadings were above .50, both of which documented the excellence of the CTOPP-2 construct validity (Wagner et al., 1999). CFA results further showed that the CTOPP-2 retained its factor structure across gender and ethnic groups; in other words, no item biases on the CTOPP-2 emerged as a result of gender or ethnic group differences (Hayward, Stewart, Phillips, Norris, & Lovell, 2008; Wagner et al., 1999).

The CTOPP-2 has shown strong concurrent criterion-related validity via its significant associations with other reading assessment tools including the Woodcock Reading Mastery Test-Revised (WRMT-R), the Test of Word Reading Efficiency (TOWRE), and the Lindamood Auditory Conceptualization Test (LAC; Hayward et al., 2008). Studies have examined the effective use of the CTOPP-2 to distinguish between students who later require reading interventions versus students who did not have provided predictive criterion-related validity of this instrument (Hayward et al., 2008; Wagner et al., 1999, 2013).

**Reliability.** In addition to validity, psychometrically sound instruments should demonstrate reliability (Gall et al., 2007). The reliability of an instrument refers to its consistency in measurement of a construct across diverse participant groups, settings, and times (DeVon et al.,
The types of instrument reliability include *inter-rater reliability*, which pertains to the degree of agreement between two or more observers of a behavioral construct (DeVon et al., 2007). *Test–retest reliability*, which assesses the consistency in instrument scores across time-points usually weeks or months apart, is determined by “administering the same test to the same group of respondents at different times” (DeVon et al., 2007, p. 160). Inter-rater and test-retest reliabilities are often calculated using correlational analyses, such as Pearson bivariate correlations, and the quality of these reliabilities are determined by the coefficients being significant at $p < .05$ (DeVon et al., 2007). The third type of reliability is *inter-item reliability*, which pertains to the conceptual fit of items on an instrument or how well the items fit on a scale (DeVon et al., 2007). The inter-item reliability of an instrument is determined by calculating the Cronbach’s alpha of an instrument. A Cronbach’s alpha between .70 and .79 is considered good, a Cronbach’s alpha between .80 and .89 is considered very good, and a Cronbach’s alpha .90 or higher is considered excellent (Tabachnik & Fidell, 2013).

**Reliability: WIST.** The WIST (Wilson & Felton, 2004) has demonstrated good reliability as it pertains to inter-rater, test–retest, and inter-item consistency (Wilson & Felton, 2004). The inter-rater reliability coefficients for the WIST subtests have ranged from the low .80s to high .90s (Langenberg, 2013; Wilson & Felton, 2004), and two-week test-retest reliability coefficients have ranged from .68 to .95 (Langenberg, 2013; Wilson & Felton, 2004). The two subtests of the WIST have strong inter-item reliabilities: .98 for the Word Identification subtest and .96 for the spelling subtest (Wilson & Felton, 2004).

**Reliability: CTOPP-2.** The CTOPP-2 has demonstrated good reliability as it pertains to inter-rater, test–retest, and inter-item consistency (Wagner et al., 1999, 2013). The CTOPP-2 has been shown to have inter-rater reliabilities from the low to high .90s (Hayward et al., 2008;
Two-week test–retest reliability coefficients have ranged from .72 to .93 (Hayward et al., 2008; Wagner et al., 1999, 2013). With regard to inter-item reliability, “100% of the alphas for the CTOPP subtests reached .70, with 76% attaining .80… and 19% attaining .90, the optimal level” (Wagner et al., 1999, p. 68).

**Generalizability (external validity threats).** As noted by Fraenkel et al. (2011), generalizability is very important in quantitative research studies, as “most quantitative researchers want to establish generalizations that transcend the immediate situation or particular setting” (p. 11). The most significant threat to this single-subject research study was its external validity, as inherently single-subject research studies have poor external validity due to small sample sizes and their assessments of specific interventions for specific samples (Fraenkel et al., 2011; Kazdin, 1982; Kratochwill et al., 2010).

Replication of single-subject research studies is the most effective means to enhance external validity. As stated by Fraenkel et al. (2011), “Studies involving single-subject designs that show a particular treatment to be effective in changing behaviors must rely on replications - across individuals rather than groups - if such results are to be found worthy of generalization” (p. 314). Hence, this study’s external validity was improved by including three study participants, with the idea that by observing the behaviors of more than a single individual, generalizations of results were more likely to be achieved. Moreover, given that the main intent of this study was to evaluate the impact that multisensory, explicit, and systematic practices had upon student achievement in two foundational academic areas of encoding and oral reading, the results could be generalized to the larger population of students with learning impairments in these two targeted subject areas. Nonetheless, as the goal of this study was to determine the efficacy of a literacy intervention geared toward improving oral reading and spelling on second-grade students with
reading deficits, the results of this study cannot be generalized to all subgroups of students (e.g.,
school grade and learning ability groups) throughout early elementary to later grades.

**Protection of Human Subjects**

Ethical considerations have been reviewed extensively to protect the participants of this
study, especially since this target population is under the age of 19 years old (Creswell, 2009). In
order to address the matter in question, the researcher has ensured all I.E.P.’s are signed by parents
of the participants, thus confirming that consent has been given to implement the delivery of
academic services in the subject areas of encoding and oral reading. The issue of confidentiality
has also be addressed in students’ IEPs since it is mandated by federal guidelines and outlined in
IDEA (2004). Therefore, no names will be identified in this study under the procedural safeguards
and students’ rights within special education.

Since the researcher served as both the conductor of this study and as the special educator,
it was the researcher’s responsibility to protect the participants involved in this study (Creswell,
2009). This involved an established code of professional conduct, mutual trust prior to the
implementation of the study, and overall respect for the needs of this specific population in lieu of
the fact that children of this cohort possess learning issues and can potentially be more vulnerable
than alternate subgroups of students (Creswell, 2009). As a result, these factors were taken into
consideration and carried out within this research study.

All features of this study, including the methods used, were accepted principles of students’
educational plans, which were also approved by the case manager prior to parental consent of
implementing IEPs. Although this proposed study included students under the age of 19 years old,
there was no plausible explanation as to how this population of students could be harmed
academically, cognitively, emotionally, or physically. In fact, many of the current multisensory,
explicit, and systematic practices implemented in this study were being utilized for students with special needs based on the mandated required instruction stated in educational programs. Once eligibility was established for students’ IEPs, the special education team already made the determination that students comprising this subgroup required specially designed instruction consisting of high leveraged instructional strategies. Consequently, numerous multisensory, explicit, and systematic instructional practices typically generated past practices where these instructional methods were already being embedded within the content of the curriculum for students with learning impediments.

**Conclusion**

This chapter demonstrated how the intended research design addressed the problem of practice. Data embedded in pretests and posttests encompassed two norm-referenced assessments to measure each of the dependent variables: encoding and oral reading. To ensure that validity and reliability means have been established with fidelity, the researcher instituted a prescribed methodology to carry out these measures sufficiently both in instrumentation and procedural-based instruction, which were administered to the participants in this research study. Furthermore, the researcher utilized a visual analysis method to determine whether or not a functional relationship existed between multisensory, explicit, and systematic practices and student achievement in oral reading and encoding. A comprehensive analysis regarding this research design as well as the data collection methods employed in this study will be reviewed extensively in Chapter 4.
Chapter 4: Research Findings

As standards have increased in rigor based on national initiatives, it is more vital now than ever that learning gaps be addressed with students who exhibit diagnosed disabilities and delays (CCSS, 2010; IDEA, 2004; NCLB, 2001). The purpose of this study was to examine the effects of a specialized intervention that incorporated multisensory, explicit, and systematic instruction on student achievement in the areas of oral reading and encoding for students with learning difficulties. This chapter includes a restatement of the research questions, a descriptive sample of the population of study, research findings, and a summary of the data acquired from this study.

Description of Sample

The study sample was comprised of three second-grade students, all of whom had been diagnosed as having learning difficulties in the areas of oral reading and encoding. Student A was a Hispanic female (age 7). Student B was a Caucasian male (age 7) and Student C was a Hispanic male (non-White, age 8).

Student A has been diagnosed with a developmental delay in language attributed to a health disability in communication skills, and her reading and spelling levels were below age and grade level expectations. Her education plan recommended the use of instructional practices focusing on step-by-step guidance and the breakdown of tasks and the use of visual and verbal aids. Student B has been diagnosed with a developmental delay with specific impairments in oral reading fluency, writing (specifically encoding), and processing deficits. Team evaluations documented that Student B was unable to meet grade and age-level expectations. His educational plan required a specifically designed instruction in oral reading and spelling. Student C required special education services due to a health deficit, where academic strategies were put in place for this student in order to access second grade curriculum content due to his poor academic skills in literacy. It is
particularly vital that student C receive an extended period of time to process language in order to complete literacy-based tasks. Assessments administered at the beginning of the year indicated very poor scores in oral reading and spelling.

A comprehensive evaluation took place prior to the determination of eligibility for pull-out special education services and the team recommended pull-out instruction five days a week for 45 minutes each day. As a result, all three students had specific goals and objectives related to oral reading and spelling in accordance with their IEPs.

**Description of Study Intervention Implementation**

The implementation of this study intervention was an integral component of the targeted research study. Zigmond (1997) highlighted his findings on special education based on the needs of this population and the instruction required to address these needs to maximize academic performance: “Special education is first and foremost focused on individual need. It is carefully planned. It is intensive, urgent, relentless, and goal directed. It is empirically supported practice, drawn from research” (p. 385).

**Baseline phase.** The baseline phase is the phase before intervention. There were three weeks of baseline testing. The researcher solely focused on administration of assessments, determining learning gaps, and ensuring that the implemented intervention involved a framework aligned with students’ learning needs. Since the baseline phase began at the very start of school, the instruction in the classroom was aligned with developing a community of learners, which embedded an extensive focus on building classroom community that incorporated social and emotional literacy skill development to ensure that the school climate demonstrated a specific mindset of learners. As a result, the baseline phase focused on building a school culture where students were taught skills that adhered to the core values of the school.
A carefully planned scope and sequence was implemented based on the needs of the students. There were a total of 25 sessions, each of which lasted 45 minutes. Each session was held in the instructor’s classroom. Oral reading and spelling were taught simultaneously and in accordance to the needs of the students. The short-term objective within this five-week study was to address foundational skills in accordance with the curriculum standards required for second grade and substantiated with respect to IEP goals and objectives. A unit of study was incorporated each week, and goals consisted of developing fluency, accuracy, and proficiency in words consisting of a variety of different syllable patterns while teaching spelling concurrently: (a) short vowel sounds (a, e, i, o, and u) consisting of consonant blends (gr, sl, pl, fr) and consonant digraphs (sh, ch, th, wh); (b) vowel-consonant-e pattern (CVCE words such as male, tube, dive, role, and Pete); (c) vowel teams (vowel diphthongs such as oo, ee-ea, and ai-ay); (d) r-controlled syllable types (ar, or, ir, ur, and er); and (e) application of spelling rules and generalizations (such as ck/k and ch/tch) simultaneously with oral reading.

The duration of this study embedded a variety of different activities consisting of multisensory, explicit, and systematic evidence-based practices. These activities were embedded into a variety of instructional strategies. Two strategies, both of which involved the teacher’s use of step-by-step prompts, focused on enhancing students’ ability to (a) sequence information, by breaking down phonemes (individual sounds) needed for the development of oral reading; and (b) sound segmentation, by breaking down words into individual phonetic units. Other instructional strategies were (a) the use of embedded systematic phonics instruction (where the alphabetic system of written language was broken down into speech sounds that are required for reading development); and (b) the use of incremental cumulative instruction (where students transitioned from one skill to the next upon mastery of language acquisition). Some simplistic yet effective
strategies included drills (i.e., repeated practice of pronouncing letters and sounds) and students’ use of instructional supports such as mnemonic devices, visuals, and hands-on activities. Finally, the students’ use of the Lexia computer-based program reinforced the skills that were taught weekly.

In order to measure implementation fidelity, the researcher developed a progress monitoring checklist, extensive lesson plans, and an instructional log to document methods delivered from the teacher to students within this study along with what instructional exercises the students participated in given the skill taught that particular week (refer to Appendix A). This allowed the researcher to further examine research-based practices between the intervention and student learning outcomes in oral reading and encoding. Furthermore, the researcher adhered to the intended instructional methods for the duration of this study, ensured students received an ample amount of exposure to the intervention by incorporating 45-minute daily lessons, and made certain that the quality of instruction addressed the precise learning needs of the students. Moreover, the specifics of all components regarding the program’s implementation were derived from research-based instructional methods that were responsive to students’ needs based on the level of engagement embedded in instruction. As a result, the fidelity of implementation was a critical factor in this study to maximize the intervention’s effectiveness and ensure that all facets of this research study were carried out with integrity.

Implementation fidelity was an essential component of the administered intervention, specifically for this study sample. This particular intervention was designed to address the learning needs of the student sample in conjunction with students’ goals and objectives within their stated IEPs. The researcher made every effort to incorporate the accommodations and modifications within these plans for the duration of each instructional lesson. Based on the
baseline monitoring information obtained, along with the goals and objectives that were designed for this population of students, the researcher developed her instruction with particular attention to these factors. Each target skill for the week focused on a syllable type required for the development of oral reading and spelling in conjunction with goals and objectives on students’ educational plans, and as measured by the CCSS (2010) for second grade; lesson plans for this study are depicted in Appendix B. Furthermore, oral reading and spelling were taught simultaneously given the specialized reading programs that were utilized for this study. In order for students to develop reading and spelling competence, the instructional tools used enhanced the fidelity of implementation and the researcher developed an instructional log in order to allow a detailed description of the instructional methods embedded in this study (refer to Appendix C).

**Data Collection: Baseline and Intervention.** Two educational assessment instruments were used in this study: the WIST, which was used as an assessment of students’ spelling skills, and the CTOPP-2, which measured students’ oral reading skills. Both of these assessment have numerous scoring options (e.g., raw, norm-referenced, percentile, chronological age, standard). In this study, the WIST utilized standard scores and the CTOPP-2 used composite scores. Both assessments have a mean of 100. However, the standard deviation for the WIST is +/-15 points, while the standard deviation for the CTOPP-2 is +/- 10 points. Table 5 provides the range of scores and the corresponding classifications for both assessments.

Baseline data collection occurred over the three weeks prior to the implementation of the instructional intervention, with data being collected at five different time-points equally spaced over these weeks. Intervention data collection occurred every week over the course of the five-week intervention.
Table 5

*WIST and CTOPP-2 Standard Score and Composite Score Ranges and Classifications*

<table>
<thead>
<tr>
<th>WIST scores</th>
<th>CTOPP-2 scores</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;131</td>
<td>&gt;130</td>
<td>Very superior</td>
</tr>
<tr>
<td>121-130</td>
<td>121-130</td>
<td>Superior</td>
</tr>
<tr>
<td>111-120</td>
<td>111-120</td>
<td>Above average</td>
</tr>
<tr>
<td>90-110</td>
<td>90-110</td>
<td>Average</td>
</tr>
<tr>
<td>80-89</td>
<td>80-89</td>
<td>Below average</td>
</tr>
<tr>
<td>70-79</td>
<td>70-79</td>
<td>Poor</td>
</tr>
<tr>
<td>&lt;69</td>
<td>&lt;70</td>
<td>Very poor</td>
</tr>
</tbody>
</table>


**Visual Analysis**

The preferred data analysis for single-subjects research is visual analysis, which was defined by Kazdin (1982) as the process for reaching a sound judgment about intervention effects on student outcomes by engaging in a systematic visual examination of graphed data. The investigator followed the four “systematic rules” or steps of visual analysis as described by Kazdin (1982, p. 45), and she examined the data with regard to the five elements of graphed data: (a) level, (b) trends in data, (c) variability in data, (d) data overlap, and (e) immediacy of change. Level was depicted as the mean and median within this research study, and trends of data were displayed as the inclination of data (as represented through the graphs) within the baseline and intervention phases. Variability of data signified the extent to which the data points were distributed in correlation to the line of best fit. Data overlap of the graphic analysis charts revealed at what points overlap existed between the baseline and intervention phases. The immediacy of effect delineated to what degree the data shifted between the baseline and intervention phases. In the first step of the visual analysis, the researcher examined the data for levels (e.g., mean and median scores) and anticipated trends at the baseline phase (Kazdin, 1982). When a plausible baseline was established, the investigator then examined the intervention data for levels and estimated trends.
(Kazdin, 1982). The third step involved an examination and comparisons of the variability in data, latency in change, and data overlap in the baseline and intervention phases (Kazdin, 1982). In the fourth and final step of the visual analysis, the investigator assimilated information derived from the visual analysis to reach a decision as to the efficacy of the intervention on students’ spelling (encoding) and oral reading skills.

**Presentation of results from visual analysis.** For increased clarity of results from the visual analysis, results are presented for each student. Data as they pertain to the graphed data of WIST and CTOPP-2 scores at the baseline phase are first reviewed, followed by a discussion of the graphed data of WIST and CTOPP-2 scores at the intervention phase. Data for each student are discussed with regard to the five elements of graphed data, with discussions first addressing data levels, overlap, and variability, followed by a review of data trends and immediacy of change from baseline to intervention phases. For each student section, a table providing information on WIST and CTOPP-2 data and figures denoting the trends and slopes of WIST and CTOPP-2 scores augment the discussion of findings.

**Baseline and intervention for Student A: WIST scores.** Table 6 presents WIST baseline and intervention data for Student A. During the baseline phase, Student A’s WIST mean and median scores were both 77.00, which placed Student A in the Poor category for spelling skills. There was considerable overlap and very little variability in the WIST baseline scores, as evidenced by the small standard deviation of 0.70, and the minimal change of scores at the five data collection points (see Table 6).

Student A’s WIST scores increased at the intervention phase, with a WIST mean score of 79.60 and a median score of 80.00, which placed the student in the Poor category of spelling skills with regards to the mean, and Below Average in accordance with the median. There was decreased
overlap and increased variability in WIST scores during the intervention phase as evidenced by the larger standard deviation of 1.14.

Table 6

**Student A: WIST Baseline and Intervention Data Levels and Variability**

<table>
<thead>
<tr>
<th>Time</th>
<th>Variable</th>
<th>Level</th>
<th>Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>M</td>
</tr>
<tr>
<td>Baseline</td>
<td>WIST</td>
<td>77.00</td>
<td>77.00</td>
</tr>
<tr>
<td>Intervention</td>
<td>WIST</td>
<td>79.60</td>
<td>80.00</td>
</tr>
</tbody>
</table>

*Note. n = 1.*

*WIST score = Poor; WIST score = Below Average*

Figure 6 provides a visual display of the changes in the WIST baseline and intervention scores as well as the overall WIST score slopes for Student A. The WIST baseline score slope was moderately positive at baseline, but increased to an extremely positive slope during the intervention phase. This sharp increase in the intervention slope indicated an immediacy of effect of the intervention. Immediacy of effect was furthermore evidenced by the +1.00 and +2.00 point difference between the baseline Week 3 WIST score (i.e., 77) and the intervention Week 1 and Week 2 WIST scores, 78 and 79 respectively.

![Figure 6. Student A: WIST baseline and intervention scores with slopes. n = 1.](image)
Baseline and intervention for Student A: CTOPP-2 scores. Table 7 presents CTOPP-2 baseline and intervention data for Student A. The mean baseline CTOPP-2 score for Student A was 61.20; the median score was lower, \( Mdn = 59.50 \). These scores placed Student A in the Very Poor category for oral reading skills. During the intervention phase, Student A’s CTOPP-2 scores increased by over 20 points, with a CTOPP-2 mean score of 82.80 and a median score of 82.00. Based on these scores, Student A moved from the Very Poor oral reading category at the baseline phase to the Below Average oral reading category at the intervention phase. Student A did demonstrate some variability in CTOPP-2 scores at baseline, with more variability in scores seen at the intervention phase (see Table 7). There was no overlap of CTOPP-2 scores at either phase.

Table 7

<table>
<thead>
<tr>
<th>Time</th>
<th>Variable</th>
<th>Level</th>
<th>Variability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( M )</td>
<td>( Mdn )</td>
</tr>
<tr>
<td>Baseline</td>
<td>CTOPP-2</td>
<td>61.20</td>
<td>59.50(^a)</td>
</tr>
<tr>
<td>Intervention</td>
<td>CTOPP-2</td>
<td>82.80</td>
<td>82.00(^b)</td>
</tr>
</tbody>
</table>

\(^{Note. \ n = 1.}\)
\(^{a}\)CTOPP-2 score = Very poor; \(^{b}\)CTOPP-2 score = Below Average

Figure 7 provides a visual display of the changes in the CTOPP-2 baseline and intervention scores as well as the overall CTOPP-2 score slopes for Student A. Despite some variability in CTOPP-2 scores (e.g., between 58.00 and 66.00), the overall slope was flat for the CTOPP-2 baseline scores. During the intervention phase, the slope for the CTOPP-2 scores was moderately positive, with scores incrementally increasing over the five-week intervention. Figure 7 shows a considerable immediacy of effect between the baseline Week 3 CTOPP-2 score and the intervention CTOPP-2 scores, with increases seen during the first week of the intervention. There was a +16.50 and a +20.00 point difference between the baseline Week 3 score of 59 and the intervention Week 1 and Week 2 scores of 75.5 and 79, respectively.
Figure 7. Student A: CTOPP-2 baseline and intervention scores. n = 1.

**Baseline and intervention for Student B: WIST scores.** Table 8 provides WIST baseline and intervention scores for student B. During the baseline phase, Participant B’s median score demonstrated a 73, which placed his standard score in the *Poor* range. There was a high degree of overlap and slight variability, as evidenced by a standard deviation of a 1.52 (see Table 8).

Student B’s WIST scores increased once progressing to the intervention phase, with a WIST mean score of a 78.40 and a median score of 78, which placed the student in the *Poor* category of spelling skills. A percentage of non-overlapping data manifested within the last data point of the baseline testing and first data point following week one of the intervention phase, discerning an immediacy of effect at the conclusion of the second week within the intervention. Heightened variability in WIST scores was noted during the intervention phase as evidenced by the larger standard deviation of 2.30 and the higher variability in WIST scores (see Table 8).

Figure 8 presents a visual display of the changes in the WIST baseline and intervention scores as well as the overall WIST score slopes for Student B. The WIST baseline score slope was moderately positive at baseline, but increased exceptionally for the duration of the intervention phase. Comparable to Student A, this precise increase in the intervention slope demonstrated an
immediacy of effect of the intervention. Immediacy of effect was furthermore evidenced by the +3.00 point difference between the baseline Week 3 WIST score and the intervention Week 2 WIST scores. This effect was also indicated based on the scores within this moderate positive slope between Week 3 of the baseline phase (75) and Week 5 (81) of the intervention phase.

Table 8

**Student B: WIST Baseline and Intervention Data Levels and Variability**

<table>
<thead>
<tr>
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<td>Mdn</td>
<td>SD</td>
<td>Minimum</td>
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<td>WIST</td>
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<td>73.00</td>
</tr>
<tr>
<td>Intervention</td>
<td>WIST</td>
<td>78.40</td>
<td>78.00</td>
</tr>
</tbody>
</table>

*Note. n = 1.*

**Figure 8.** Student B: WIST baseline and intervention scores with slopes. *n = 1.*

**Baseline and intervention for Student B: CTOPP-2 scores.** Table 9 presents CTOPP-2 baseline and treatment data for Student B. The mean baseline CTOPP-2 score for Student B was 64.50; the median score was lower, *Mdn* = 64. These scores placed Student B in the *Very Poor* category for oral reading skills. During the intervention phase, Student B’s CTOPP-2 scores
increased to a mean score of 85.90 and a median score of 86.50. Based on these scores, Student B moved from the *Very Poor* oral reading category at the baseline phase to the *Below Average* oral reading category at the intervention phase. Student B did demonstrate steady variability in CTOPP-2 scores at baseline, although again with more variability in scores seen at the intervention phase (see Table 9). There was no overlap of CTOPP-2 scores at either phase.

Table 9

*Student B: CTOPP-2 Baseline and Intervention Data Levels and Variability*

<table>
<thead>
<tr>
<th>Time</th>
<th>Variable</th>
<th>Level</th>
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<tbody>
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<td></td>
<td>$M$</td>
<td>$Mdn$</td>
</tr>
<tr>
<td>Baseline</td>
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<td>64.00</td>
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<tr>
<td>Intervention</td>
<td>CTOPP-2</td>
<td>85.90</td>
<td>86.50</td>
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</tbody>
</table>

*Note. n = 1.*

Figure 9 presents a visual display of the changes in the CTOPP-2 baseline and intervention scores as well as the overall CTOPP-2 score slopes for Student B. Despite a very high degree of variability in CTOPP-2 scores (e.g., between 50.00 and 110.00), the overall slope was flat for the CTOPP-2 baseline scores. During the intervention phase, the slope for the CTOPP-2 scores was extremely promising, with scores incrementally increasing over the five-week intervention. Figure 9 shows a considerable immediacy of effect between the baseline Week 3 CTOPP-2 score and the intervention Week 1 CTOPP-2 scores (+7.50), with this increase seen during the first week of the intervention and a +18.00 observed following the second week of intervention.
Figure 9. Student B: CTOPP-2 baseline and intervention scores with slopes. n = 1.

Baseline and intervention for Student C: WIST scores. Table 10 presents WIST baseline and intervention data for Student C. During the baseline phase, Student C’s WIST mean score demonstrated a 76.20, and median score yielded a 76, which placed Student B in the Poor category for spelling skills. There was a slight degree of overlap and small-scale variability in the WIST baseline scores, as evidenced by the standard deviation of 1.48, and the marginal change of scores at the five data collection points (see Table 10).

Student C’s WIST scores increased at the intervention phase, with a WIST mean score of a 79.60 and a median score of 76, which placed the student in the Poor category of spelling skills. A percentage of non-overlapping data for Student C was evident between the last data point of the baseline phase and the first two data points of the intervention (remitting a standard score of 77 in the final pre-testing session and the first two scores in post-testing), indicating an immediacy of effect following the third week of the intervention phase. Heightened variability was noted in WIST scores during the intervention phase as evidenced by the ample standard deviation of 2.24 as well as substantial variability in WIST scores (see Table 10).
Table 10

*Student C: WIST Baseline and Intervention Data Levels and Variability*

<table>
<thead>
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<tbody>
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<td></td>
<td>M</td>
<td>Mdn</td>
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<tr>
<td>Baseline</td>
<td>WIST</td>
<td>76.20</td>
<td>76.00</td>
</tr>
<tr>
<td>Intervention</td>
<td>WIST</td>
<td>79.60</td>
<td>81.00</td>
</tr>
</tbody>
</table>

*Note. n = 1.*

Figure 10 provides an additional visual graphic of data regarding the changes in the WIST baseline and intervention scores as well as the overall WIST score slopes for Student C. The WIST baseline score slope fluctuated throughout the five testing trials at the baseline, but increased through a steady slope during the intervention phase. This growth in the intervention slope indicated an immediacy of effect of the intervention following Week 3 of the implemented intervention. Immediacy of effect was evidenced by the +4.00 point difference between the baseline Week 3 WIST score and the intervention Week 3 and Week 5 WIST scores, 81 and 82 respectively.

*Figure 10. Student C: WIST baseline and intervention scores and slopes. n = 1.*
Baseline and intervention for Student C: CTOPP-2 scores. Table 11 demonstrates CTOPP-2 baseline and treatment data for Student C. The mean baseline CTOPP-2 score for Student C was 78.50; the median score was slightly lower, $Mdn = 78$. These scores placed Student C in the Poor category for oral reading skills. During the intervention phase, Student B’s CTOPP-2 scores increased to a mean score of 92.70 and a median score of 91. Based on these scores, Student B moved from the Poor oral reading category at the baseline phase to the Average (lower end of the average range in accordance with the mean and median scores) oral reading category at the intervention phase. Student C did demonstrate steady variability in CTOPP-2 scores at baseline, although similar to Students A and B with more variability in scores seen at the intervention phase (see Table 11). Again, there was no overlap of CTOPP-2 scores at either phase.

Table 11

<table>
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<tr>
<th>Time</th>
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<tbody>
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<td></td>
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<td>$M$</td>
<td>$Mdn$</td>
</tr>
<tr>
<td>Baseline</td>
<td>CTOPP-2</td>
<td>78.50</td>
<td>78.00</td>
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<tr>
<td>Intervention</td>
<td>CTOPP-2</td>
<td>92.70</td>
<td>91.00</td>
</tr>
</tbody>
</table>

Note. $n = 1$.

Figure 11 displays a visual graph of the changes in the CTOPP-2 baseline and intervention scores as well as the overall CTOPP-2 score slopes for Student C. Although a significant degree of variability was noted in CTOPP-2 scores (e.g., between 75.00 and 100.00), the overall slope was flat for the CTOPP-2 baseline scores. During the intervention phase, the slope for the CTOPP-2 scores was favorable, with scores cumulatively increasing over the five-week intervention. Figure 11 shows a sizeable immediacy of effect between the baseline Week 3 CTOPP-2 score and the intervention CTOPP-2 scores, with a +10.00 increase observed during the first week of the
intervention. There was a +10.00 and a +10.50 point difference between the baseline Week 3 score of 80 and the intervention Week 1 and Week 2 scores of 90 and 90.5, respectively.

Figure 11. Student C: CTOPP-2 baseline and intervention scores and slopes. n = 1.

Conclusion

The goal of this study, which utilized a single-subject experimental design, was to determine the efficacy of a multisensory, explicit, and systematic reading intervention on second-grade students’ spelling (encoding) and oral reading skills. Results from the visual analysis of assessment data from three second-grade students suggested a relationship between specially designed methods targeted towards students with learning impediments and student achievement in encoding and oral reading. The relevance of specially designed instructional methodologies was supported in the visual analysis results. The most evident finding that emerged from this research study was that the rates of oral reading scores increased at a higher rate than spelling during the five-week intervention phase. In the fifth and final chapter, discussion of findings, limitations and implications for future research will be discussed.
Chapter 5: Discussion of Findings and Implications for Future Research

This research study examined the effects of a reading intervention program that entailed the use of specially designed instructional practices on three second-grade students’ achievement in spelling and oral reading in a Massachusetts school district. This section opens with a description of the intervention and how it was implemented. As the reading intervention was based on multisensory, explicit, and systematic teaching strategies, definitions of and discussions as to how these strategies were used in the intervention are first presented. The results as they pertain to the visual analysis are then reviewed, with the findings in this study compared to previous empirical work. The strengths and limitations of this study are then summarized, along with recommendations for future research in relation to the field of special education.

Implementation of the Program

The intervention focused on enhancing students’ spelling (encoding) and oral reading to align with the CCSS’s (2010) two reading skill goals for second-grade students: (a) “phonics and word analysis skills in decoding words,” (para. 1) and (b) reading “with sufficient accuracy and fluency to support comprehension” (para. 2). Oral reading and spelling (encoding) were taught simultaneously and in accordance with each students’ IEP goals and objectives.

Spelling (encoding) skill development. The baseline WIST scores identified significant gaps in students’ ability to identify and manipulate individual sounds in spoken words. Therefore, spelling (encoding) instruction during the first two weeks of the intervention focused on developing and enhancing students’ use of short vowel sounds. Instruction during the first two weeks focused on progressively and systematically building students’ vowel skills with regard to (a) short vowel sounds with consonant blends (e.g., clip, blend, grunt, flap); (b) short vowel sounds with consonant digraphs (e.g., ship, chum, thick); and (c) words constituting the vowel-consonant-
e pattern (e.g., gate, kite, mule). Reading and spelling (encoding) instruction in the third and fourth weekly sessions focused on enhancing encoding and decoding skills with regard to words with (a) vowel teams (e.g., oa, ee, ay); and (b) the r-controlled syllable pattern (e.g., car, torn, her bird, blur). The fifth and final weekly session of the intervention centered on enhancing students’ knowledge of varying spelling rules or generalizations (e.g., spell words with tch if they are preceded by a short vowel sound as in hatch, pitch, or fetch). Spelling (encoding) skills were reinforced through the use of the simultaneous oral spelling method (as discussed in Chapter 3). The use of this method allowed students to transfer their knowledge into independent sentence writing regarding the spelling skill of focus for that week.

**Oral reading skill development.** Students’ CTOPP-2 baseline scores indicated deficits in the understanding of phonograms (i.e., a letter or combination of letters that represent a sound such as a, e, ou, tch), which are central to developing oral reading fluency (McMaster et al., 2012). In response to identified needs for phonogram instruction as determined by CTOPP-2 scores, each of the five sessions started with teacher review of individual phonograms. Students completed this activity in an effort to distinctly reproduce the core sounds of the English language. The teacher instructed students in the area of oral reading in a progressive fashion over the five-week intervention. Instruction started with students learning words containing a specific phonogram, and moved to both isolated word reading and sentence reading with the phonogram. The teacher gave particular attention to helping students learn how to segment and blend individual sounds in words by using a finger tapping procedure. Once these skills were mastered, they were reinforced through a variety of activities. Each lesson incorporated a writing activity (e.g., vocabulary matching, categorizing words, cloze sentence exercises). At the end of each weekly session,
students practiced their oral reading skills via interactive phonics-driven activities using the Lexia software program.

**Use of Multisensory, Explicit, and Systematic Teaching Strategies**

NCLB mandates require rigorous academic standards that students are expected to achieve in literacy skill development (Au, 2009; Billingsley, 2010). Despite current improvements in IDEA (2004), a major federal initiative that was developed with the goal of supporting students with disabilities, the rate of academic achievement for students with learning obstacles continues to be insufficiently below anticipated age and grade-level expectations in comparison to where students should be performing in accordance with the CCSS (2010; Au, 2009; Osborne & Russo, 2014; Russell & Bray, 2013). Although students who are eligible for special education are able to receive academic interventions specific to their academic needs via their IEP, a significant achievement gap continues to persist between students with disabilities and their peer counterparts without disabilities (Denton, 2012; McMaster et al., 2012).

The reading intervention incorporated three types of instructional strategies. The first instructional strategy used in the reading intervention was *multisensory teaching*, which involved the use of visual, auditory, and tactile-kinesthetic modalities “simultaneously to enhance memory and learning of written language” (Gorjian, Alipour, & Saffarian, 2012, p. 192). Multisensory teaching methods also included a variety of hands-on activities where students were able to utilize visual, auditory, and kinesthetic-tactile modalities for reinforcement of all skills that taught oral reading and spelling domains. These skills allowed students to activate a variety of senses through different techniques. The second strategy was *explicit teaching*, which is defined as direct and guided instruction that places emphasis on “proceeding in small steps” and assessing the skill taught (Archer & Hughes, 2011, p. 1). According to Rosenshine and Stevens (1986) and
Rosenshine (1997), explicit teaching incorporates six strategies designed to facilitate the process of student learning: (a) review, (b) presentation, (c) guided practice, (d) corrections and feedback, (e) independent practice, and (f) weekly or monthly reviews (as cited in Archer & Hughes, 2011, p. 4). The teacher utilized these six strategies when implementing the reading intervention.

In an effort to maximize student learning for each instructional session of the reading intervention, the teacher reviewed phonogram cards for each instructional session (review); students independently read nonsense words, isolated words, and decodable texts that correlated to the skill taught for that particular week (independent practice); and students engaged in learning games for reinforcement of skills taught (review and guided practice). Additionally, structured spelling dictations were embedded into daily lessons (teacher guidance or independent practice), and a highly structured phonics supplemental technology program entitled Lexia was incorporated to review learning concepts extensively (guided practice, review, corrections, and feedback).

Systematic teaching was the third teaching strategy used in the reading intervention. Systematic teaching, based on the premise that prior knowledge of a reading concept helps advance the learning of a new reading concept, follows a methodical sequence of acquiring reading and writing concepts, beginning with fundamental skills and progressing to more complex concepts (Denton, 2012; Morrow, Gambrell, & Duke, 2011). Systematic teaching was of critical importance to the reading intervention. This teaching strategy allowed the teacher to carefully and thoroughly plan and implement the reading intervention in accordance with curricular modifications to align with the students’ IEPs, as well as format lessons and employ sequential methods of instruction that specifically addressed students’ reading and writing skill needs as noted in their IEPs. For example, the sequence of instruction began with one-syllable words consisting of short vowel sounds, followed by teaching of the silent e pattern. The next transition
week focused on vowel teams, followed by a shift of words with the r-controlled syllable type, and then ending with spelling rules or generalizations of the English language and needed for second-grade word study acquisition. The sequence of skills taught was systematic due to the progression of concrete to abstract teaching of both daily and weekly concepts.

Results of the Visual Analysis

The research question for this study was: Are specialized, instructional approaches that are multisensory, explicit, and systematic effective for students who exhibit learning impairments in the subject areas of encoding and oral reading? Three second-grade students who required extensive instruction per their IEPs to enhance their skills in oral reading and encoding received the intervention. As stated previously in Chapters 1, 2, and 3, two commonly utilized norm-referenced and validated educational assessment instruments were used in this study: (a) the WIST, which was used as an assessment of students’ spelling (encoding) skills; and (b) the CTOPP-2, which measured students’ oral reading skills. The teacher assessed the three students five times during a three-week baseline phase and five times during the intervention. In the visual analysis of students’ baseline and intervention data - the recommended analysis for single-subject research - the investigator examined the data with regard to the five elements of graphed data: (a) level, (b) variability in data, (c) data overlap, (d) trends in data, and (e) immediacy of change (Kazdin, 1982). The comprehensive visual analysis allowed the researcher to derive conclusions regarding the efficacy of the reading intervention on students’ encoding and oral reading skills.

Spelling (encoding) skills: WIST scores. The major findings from the WIST scores in the area of spelling attested to the following interpretations:

1. Overall WIST mean score at baseline was 75.53 and scores ranged from 72 to 78; these scores placed students in the Poor category.
2. The overall WIST mean score at intervention was 79.2, and scores ranged from 75.00 to 81.50; these scores placed the students almost in the Below Average category.

3. The WIST scores increased to such a degree during the intervention phase that students moved from a lower to a higher skills category.

4. WIST scores increased a mean of 2.67 points between the last baseline assessment and the first intervention assessment on average for all three students.

5. The elevated scores at the first intervention phase showed an immediacy of effect of the intervention for Student A. Student B did not demonstrate an immediacy of effect until the second week of the intervention, and Student C’s immediacy of effect did not occur until the third week of the intervention.

It should be noted that Student B was experiencing a difficult transition from a larger class setting to a pull-out setting model on a daily basis (which could have had an impact on his score in this area), and Student C was experiencing poor health at the time of the first two weeks - this type of discomfort could have certainly had an impact on his overall spelling score progress.

**Oral reading skills: CTOPP-2 scores.** Findings of the CTOPP-2 scores indicated favorable outcomes following week 1 of the intervention phase, demonstrating an immediacy of effect for each of the three students. The most significant findings attributed to the data were as follows:

1. The core CTOPP mean score in the pretesting phase demonstrated an aggregate of 67, and scores ranged from 58 to 81.5.

2. Following the implemented intervention, the CTOPP-2 indicated a mean score of 87, and scores fluctuated from 71.5 to 102.5; placing students’ scores in the average range.
3. While slope scores demonstrated slight variability in the baseline phase, there was a significant effect upon the practices incorporated in the intervention at a greater degree than spelling (encoding) skills.

4. The CTOPP-2 scores improved to a level commensurate with age and grade-level expectations in students’ phonemic awareness skills when measuring phoneme-grapheme (sound-symbol) relationships.

**Review of Visual Analysis Results**

The results of the visual analysis of the baseline and intervention WIST and CTOPP-2 data suggested that the reading intervention significantly improved special education second-grade students’ oral reading skills and steadily increased students’ spelling scores. The moderate increases in WIST scores in comparison to the large increases in CTOPP-2 scores suggested that the reading intervention was more effective in enhancing students’ oral reading skills than spelling (encoding) skills. This difference may be attributed to a variety of exceptions to spelling patterns with regards to specific aspects of the English language, which requires a great deal of memorization on the part of the student (Rudginsky & Haskell, 1984). Rudginsky and Haskell (1984) identified numerous exceptions to encoding rules and generalizations of the English language in four comprehensive editions of a text entitled *How to Spell (Books 1-4)*, noting that there are a variety of patterns in the language that can solely be memorized by sight because they are considered to be words that break the rules of the spelling pattern. For example, students are taught that words with *ch* are preceded by a consonant and or a double vowel (e.g., pinch, teach), and words with *tch* are preceded by a short vowel sound (batch, fetch, hatch). Exceptions to this rule are *which*, *much*, and *such*. This is one example of a spelling rule that would require students
to memorize irregularities, which can be extremely difficult for them based on the recall of sounds, order of sounds, and overall language skill development (Rudginsky & Haskell, 1984).

**Connection to Theoretical Framework**

As encoding and oral reading were the two dependent variables measured in this study, this research design was rooted in the theoretical framework of the phonological deficit theory. This theory posits that students who have difficulties acquiring reading skills are unable to learn how to decode words through standard phonics rules, which impacts their ability to understand the relationship between graphemes and phonemes. Hudson, High, and Otaiba (2007) contended that specific areas and lobes in human brains are needed for the development of language and reading. Research derived from the phonological deficit theory clearly substantiates that in order to help students develop tasks in phonology effectively, an organized framework of phonological tasks is critical to help generate phonemic associations that are lacking (Frith, 1998; Hatcher & Snowling, 2014; Snowling & Hulme, 2012). Given the need for phonics instruction based on this particular deficit, the researcher integrated all phonetic elements into instructional practices that were executed within this research design in both encoding and oral reading.

Phonics training activities embedded into daily lessons included reinforcing student understanding between letters and sound units using phonogram cards, through incorporating the alphabetical principle (knowledge that words are made up of letters and sounds). Additional activities included skill mastery in deciphering sound structures in words, an understanding of syllable types that govern rules of the English language, blending sound cards or segmenting sound cards, manipulation of sounds through direct teaching and specialized guidance, and teacher resources that focused on one or two phonemes at a time and within a chronological order. These strategies that were employed were noticeably efficient, precise, and straightforward for this
population of students, particularly on account of the difficulty that these learners face in their understanding of the phonological facets that dictate the rules of the English language.

**Correlation Between Phonological Deficit and Instructional Program**

According to Ramus and Szenkovits (2008), there are three main dimensions of the phonological deficit: (a) inadequate phonological awareness skills, (b) weak verbal short term memory skills, and (c) poor automaticity in tasks that involve rapid naming retrieval. In order to understand how phonemes work, students are required to possess knowledge of these phonemes, recall phonemes, and produce a representation of the smallest unit of speech. Given these three areas, the researcher designed an instructional program focused on phonemes that are in alignment with the second grade CCSS (2010), strategy instruction to enhance memory and retrieval of skills taught, and integrated phonetic coding with sound-symbol relationships required for the development of reading and spelling (encoding) skill development.

This study focused on the use of multisensory, explicit, and systematic instructional practices in a reading intervention and its influence on spelling (encoding) and oral reading skill enhancement on second-grade special education students. This study was rooted in the work of Orton (1870–1948) and Gillingham and Stillman (1997), who documented the importance of multisensory teaching and the effectiveness of these practices in their empirical work, particularly for children with reading impairments. Torgeson (2002) closely examined students who were exposed to rigorous reading interventions that used a code-emphasis approach (focused on the alphabetic principle) vs. a meaning-centered emphasis approach (which focused on contextual cues), concluding that when interventions are presented explicitly and are phonetically based, success is most evident in the primary grade levels. The results of this study conceivably correlated to the embedded methods of instruction implemented. These findings have significant
implications for applicable instructional elements that should be incorporated for students with learning difficulties to attain foundational literacy achievement.

**Justification of Employed Instructional Practices**

Another significant component attributed to the findings of this study emphasizes the importance of students’ development of a solid foundation of phonetic principles using a methodical structure that follows a logical order (Gillingham & Stillman, 1997). Based on the findings of this study, it is evident that a whole language approach would not be conducive for students who possess learning problems. Following years of research and an intensive research study, Shaywitz and Shaywitz (2004) affirmed that “it is inadequate to present the foundational skills of phonemic awareness and phonics incidentally, casually, or fragmentally” (pp. 5–6). Studies on brain imaging and a thorough examination by the NRP (2000) has argued that there is now scientific evidence that proves these practices are evidence-based and effective for reading achievement.

Research conducted asserts the importance of utilizing instructional tools grounded in scientific knowledge in conjunction with the vast number of efficient resources in the field of education (Hudson, High, & Otaiba, 2007; International Dyslexia Association; 2000, 2001, 2007; IDEA, 2004; Shaywitz, et. al, 2004). Evidence-based practices that have been successful in studies included small group tutoring by highly qualified professionals who worked in the field of education, fostering literacy through skills and strategies rooted in phonological awareness and phonemic decoding competence (Campbell et al., 2008; Hwee & Houghton, 2011; Joshi et al., 2002; Krafnick et al., 2011; Oakland et. al., 1998; Olinghouse et al., 2006; Scheffel et al., 2008; Wilson & O’Connor, 1995). All three conventions that support past studies (multisensory, explicit,
and systematic instructional practices) employed in these studies produced remarkable gains upon the implementation of a highly structured reading and spelling program.

**Interrelation of Instructional Methods to Phonological Deficit Theory**

The practices utilized in this study illuminated the phonological deficit theory through the employed methods within this research design. Particularly, all techniques retracted to phonological components by teaching sound-symbol correlations that regulate rules of the central English language system. The researcher began with individual units of sound based on the syllable types that represent language. She used procedures embedding research-based programs and approaches that were explicitly taught; embedding specific routines into daily teaching sessions; repetition of basic concepts; concrete to abstract progression of instructional techniques; mnemonics (memory mechanisms that help break apart substantial information); and emphasis of key points with regard to each skill taught.

The strategies embedded in this research study revert back to studies that reinforce the efficacy of specialized instructional practices parallel to the phonological deficit theory. Oakland’s et al., (1998) evaluation of the Dyslexia Training Program validated the findings of this research design for both dependent variables (spelling and oral reading) in utilizing multisensory methods of instruction. The focus was on reading and spelling achievement through a multisensory program called Alphabetic Phonics (a spin-off incorporating practices used in Orton-Gillingham). Although this particular study was much lengthier than the implementation of the research design utilized in this examination, there was a strong demonstration that frequency and duration were two main elements in addition to explicit instruction that contributed to the positive gains in student achievement across these two subject areas.
Evidence of Existing Literature to Support Instructional Practices

The existing literature supports further studies conducted in the field of special education. Particularly, Ehri’s et al. (2001) findings on a meta-analysis study based on quantitative data examined 96 treatment-control comparison groups and discerned a number of conclusions based on this examination. The panel’s findings found that small group teaching was effective, specifically in comparison to teaching individual students or whole classes. Additionally, this investigation found that teaching one or two domains had a higher effect than teaching more than two skill sets at a time. When measuring readers who were considered to be disabled, children who ranged from ages 7-12 did improve somewhat with regard to phonological awareness. However, although it did appear that elements of specially designed reading programs and approaches were incorporated within this study, it was not clear whether or not specific components of specially designed reading programs were embedded with fidelity (such as Orton-Gillingham, Wilson, Lindamood-Bell, etc.), which may have had an impact on the overall results of the students’ scores.

Other research studies validate the efficacy of this study’s findings. O’Connor and Wilson (1995) examined the effects of multisensory teaching methods through a pull-out program using elements of the Wilson Reading System focused on reading and spelling. Similar to the implemented study in this research design, a phonetic approach using a combination of visual, auditory, and kinesthetic pathways was employed to measure word attack, encoding, and reading comprehension skill development. Although Wilson and O’Connor (1995) had a high number of participants (220 subjects), expanded across a lengthier time period than this study, and only incorporated two to three lessons per week (this research design embedded five lessons per week)
ranging in duration from 50 minutes to 1 hour of instruction per week, results demonstrated these specialized instructional methods led to significant positive gains in student achievement.

An additional study that supports incremental reading scores incorporated in this study was developed by Shaywitz et al. (2004) through the investigation of brain imaging following a comprehensive intervention. The experimental researchers of this study argued that effective teaching can actually modify the design of the brain as well as how it performs and help students who encounter difficulty developing reading skills. Of the 77 children who were participants in this study, 49 had significant difficulties in the area of reading. A rigorous reading program focusing on phonology was embedded for 37 of the readers, while 12 of the students received typical instruction to enhance reading skill development in the classroom setting. The 37 readers in the intensive program outperformed all 12 readers who received a conventional teaching program, specifically in the areas of accuracy, fluency, and comprehension. The most compelling aspect of this study was that fMRIs (functional magnetic resonance imaging that measures brain functions) determined that brain regions began to work in a similar way to the brains of solid readers by comparing an investigation of before and after brain imaging observations. The research team concluded that specific functions in the brain can be altered based on the plasticity in which brain structures work through the assimilation of effective instructional methods.

**Homework Importance**

Homework has been acknowledged as an integral component to student achievement. In order to reinforce weekly skills and follow up on strategies taught in the classroom setting, Warger (2001) identified five key elements that allow students with learning impediments to master curriculum content. These included (1) assignments that students are able to comprehend easily, (2) adaptations in accordance with the subject matter taught, (3) application of strategies for
studying content, (4) utilization of an agenda to keep track of homework assignments, and (5) ensuring an established pattern of consistent communication with families. According to Research Connections in Special Education (2001), students highlighted that the importance of teacher presentation of varied modules, including:

- Assigning homework toward the beginning of class.
- Explaining how to do the homework, including providing examples and writing directions on the chalkboard.
- Giving students time to begin the homework in class and checking for understanding and/or providing assistance at that time.
- Assigning homework in small amounts.
- Relating homework to classwork and/or informing students how they will use the content of the homework in real life.
- Checking homework and giving feedback on it to students. (as cited in Homework Practices that support students with disabilities, 2001, p. 16)

**Implications for Future Research**

As implications for future research are considered, one of the cornerstone elements that has been derived from this particular research study are that research-based programs and approaches are pivotal for students with spelling barriers, reading difficulties, and overall literacy learning impairments. This study also attests to the efficacy of frequency and duration of instruction, as evidenced in daily lessons with sufficient instructional time for teaching, student exercises involving skills and strategies taught with teacher guidance, and student independence in reference to application of mastery regarding skills taught. Moreover, a highly qualified professional who has background knowledge in research-based instructional programs as well as teaching
experience is critical to the success of student achievement. The findings of this study reinforced the recommendations generated by the NRP (2000) and IDEA (2004). Early intervention is a further element of student acquisition in foundational literacy skills, as measured and validated by the current research findings in this study. Moreover, spelling and reading skills should be taught interchangeably without being disparate from one another in view of the fact that grapheme-phoneme relationships are critical components in the area of phonemic awareness, specifically for students with learning barriers.

The NRP (2000) identified areas for future research as phonemic awareness, phonics, and fluency, which correlate significantly to the findings of this implemented study. Recommendations for future research substantiate the need to examine the efficacy of small group instruction and ensure that teachers have clear knowledge of research-based programs prior to the implementation of interventions. Future research also signifies the eminent use of employing computer-based programs that are adept at teaching phonemic decoding skills in alignment with 21st century skills in education with a strong emphasis on technology, advocating for using it in a meaningful manner for students. This would require adopting a memorandum that incorporates a comprehensive program based on the needs and gaps of students with learning disadvantages.

At the present time, there is room for further research in an effort to validate the efficacy of specialized instructional practices required for students with learning obstacles to experience academic success. The researcher has generated the following conclusions based on the findings of this study:

1. A well-designed instructional program where students can spiral back to previously taught skills is fundamental to foster student achievement in foundational literacy.
2. Research-based educational programs should be administered by highly qualified educational professionals who have the training and expertise required to work with students who exhibit learning impairments.

3. Early intervention instruction is critical to ensure that students can access higher-level knowledge of curriculum-based content once there is a shift to concepts that extend beyond foundational literacy skill development.

4. Frequency and duration of implemented interventions must be embedded into a specially designed curriculum to maximize student learning outcomes.

5. Weekly homework assignments should be designed using research-based practices in accordance with the CCSS (2010) grade level standards in literacy to reinforce student learning and communication between home and school.

**Strengths of the Study**

The major strength of this study was attributed to its true experimental design. Gravetter and Forzano (2011) contended to the advantage of single-subject studies, reinforcing the ability to focus on a specific treatment tailored to the needs of the few number of participants and the overall outcome of the implemented intervention. Another strength was attributed to the subjects of focus within this study (in this particular study the participants qualified under special education), and the treatment may likely be applicable to additional students who are eligible for remedial support and possess IEPs. Finally, this study allowed the researcher to be flexible in the embedded methods of instruction based on the needs of the population being studied.

**Limitations of the Study**

There were specific limitations to this research, as with any study design. Understanding these shortcomings is extremely important when interpreting the population of study,
implementation of intervention, and comparing pre-post test scores. First and foremost, the most significant limitation was attributed to the number of subjects studied, considering that only three subjects served as participants within this research design. Although single-subject studies use a lesser number of participants, it may not be ideal for assessing an entire classroom of participants based on the limited number of students that single-subject designs employ. Large numbers of participants were simply not available due to the population being studied within this research design. As a result, external validity factors are in general a major disadvantage of single-subject designs, as it may be extremely difficult to generalize these results to the larger group setting.

The second limitation dealt with the aspect that all students were instructed simultaneously. Ideally, the most effective treatment for students who are eligible for pull-out support in special education would be in a 1:1 setting. However, this was not feasible in consideration of circumstances with regard to the time of the reading intervention block period. The focus was on innovative specialized practices using research-based instructional methods; students therefore could not receive an additional type of reading instructional program in their classroom setting. All students participating in this study had their reading instruction during the same block of time in the classroom setting, and needed to be solely exposed to the intervention of study to maintain the fidelity and integrity of this examination.

The third limitation of this study was that the results utilized relied solely on visual inspection of data, which may result in implausible interpretations based on the illustrative figures in Chapter 4. As a result, the researcher must be careful in her interpretation of generating inferences based on graphic data. The fourth limitation was attributed to the number of assessments that were administered to students. As Creswell (2009) highlighted, “participants become familiar with the outcome measures and remember responses for later testing” (p. 164).
Due to the instructional duration of this implemented intervention, the researcher was unable to prolong proliferations of time between the administration of assessments (given the volume of this five-week intervention). Moreover, the researcher was unable to use questions that were different from previous assessments within the baseline and treatment phases due to the skills being measured. The same test items needed to be administered in the exact manner for both oral reading and spelling because of the independent variables being examined within the execution of this research design.

**Conclusion**

In conclusion, the purpose of this research study was to investigate instructional practices on second graders by employing multisensory, explicit, and systematic methods of instruction by means of a single-subject experimental study through visual inspection of graphic data. Based on the findings of this study, the researcher failed to accept the null hypothesis. In this study design, the conclusion demonstrated a causal relationship between the execution of instructional methods and student learning outcomes in spelling (encoding) and oral reading achievement. Students instructed through specialized practices demonstrated gains in both spelling and oral reading. This study provided experimental data to support the implementation of these established practices. However, there continues to be a need for further exploration to ensure that students with learning deterrents are instructed under the proper conditions and educated through a scope and sequence that is appropriate for learners; particular attention must also be given to the underlying principles of teaching spelling and reading simultaneously to help develop these skills reciprocally. Further research-based interventions should be explored in order to close the achievement gap with learners who require specialized instruction due to their inability to access the classroom literacy curricula.
References


doi:10.1177/002221949803100204


Appendix A

Phonogram Checklist for Oral Reading and Spelling Delineated in Study

**Phonogram Checklist for Oral Reading**

**Reading**

Short Vowels
- 1. a (apple)
- 2. e (elephant)
- 3. i (igloo)
- 4. o (octopus)
- 5. u (umbrella)

Vowel-Consonant-E
- 1. a-e (late)
- 2. e-e (eve)
- 3. i-e (pine)
- 4. o-e (home)
- 5. u-e (mule)

Consonant Digraphs
- 1. sh (ship)
- 2. th (thud)
- 3. wh (when)
- 4. ck (tack)
- 5. ch (chin)

Vowel Teams
- 1. oa (boat)
- 2. ai-ay (mail, day)
- 3. ee-ea (eat, meet)

R-Controlled Syllables
- 1. ar (car)
- 2. or (horn)
- 3. er (her), ir (bird), ur (turn)

**Phonogram Checklist for Spelling**

**Spelling**

Short Vowels
- 1. a (cat)
- 2. e (ten)
- 3. i (sit)
- 4. o (hop)
- 5. u (cup)

Vowel-Consonant-E
- 1. a-e (late)
- 2. e-e (eve)
- 3. i-e (pine)
- 4. o-e (home)
- 5. u-e (mule)

Consonant Digraphs
- 1. sh (ship)
- 2. th (thud)
- 3. wh (when)
- 4. ck (tack)
- 5. ch (chin)

Vowel Teams
- 1. oa (boat)
- 2. ai-ay (mail, day)
- 3. ea-ee (eat, meet)

R-Controlled Syllables
- 1. ar (car)
- 2. or (horn)
- 3. er (her), ir (bird), ur (turn)
### Week 1 Unit of Study: Short Vowels with Consonant Blends and Consonant Digraphs

**Rationale:** The purpose of this unit of study is for students to be able to understand the relationship and distinguish between short vowel sounds, consonant blends (e.g., cl, cr, fl, gr,) and consonant digraphs (e.g., sh, ch, wh, th, and ck) in isolation as well as within the context of oral reading. As part of the common core state standards, students are required to apply spelling words containing the short vowels of a, e, i, o, and u with corresponding consonant blends and digraphs and distinguish between short vowel sounds in one-syllable words.

**Common Core Standards in Relation to Second Grade Curriculum:**

**Phonics and Word Recognition:**

- **CCSS.ELA-Literacy.RF.2.3**
  
  Know and apply grade-level phonics and word analysis skills in decoding words.

- **CCSS.ELA-Literacy.RF.2.3.a**
  
  Distinguish long and short vowels when reading regularly spelled one-syllable words.

**Materials:** Short vowel mats, magnetic boards, sound cards, paper and pencil activities, hands-on activities, Explode the Code Workbook – Book 2, Multisensory Learning Associates Workbook 2, easel, consonant blend cubes, color-coded index cards, short vowel mats, learning games for reinforcement of skill taught, and Lexia computer program.

**Objectives:**

Students will be master how to read and spell words that have the short vowel sounds of a, e, i, o, and u with consonant blends and consonant digraphs as well as apply these word attack skills with fluency and accuracy (as measured in educational plans).

**Procedures:**

1. The teacher will have short vowel sounds on phonogram cards (i.e., sound cards) along with a visual next to it. “A” will consist of apple, e - “Eddy” the elephant, i-igloo, o-“Ozzy” the octopus, and u-umbrella. The teacher will model the letter, sound, and keyword to students. Students will then practice the letter, sounds, and keywords as a group. A graphic organizer of all short vowels along with their pictures will be on display for students so they are able to refer back to it if they need to during the course of the week’s lesson. The teacher will have written on the board the definition of a closed syllable. The following will be written on an easel: “A closed syllable is a part of a word or word with a short vowel sound that is closed in by a consonant (e.g., cat, fun, met, pin, and hop).” Students will be asked to underline the short vowel sound and circle the final consonant in the word to reinforce the concept of a syllable that is closed.

2. The teacher will have students practice a sound card each day of this week, beginning with the letter a. Students will be asked to state the letter, sound, and keyword for the letter. All sound cards will focus on the short vowels a, e, i, o, and u as well as the consonant digraphs sh, ch, wh, th, and ck. Teacher will dictate specific sounds and students will be asked to write sounds on color-coded index cards and use magnetic tiles to identify specific phonograms (sounds) as well.  

3. Students will read several words containing short vowel sounds, consonant blends, and consonant digraphs (e.g., shin, chat, fun, clip, pet, frog, Tim, Jen) for the second activity of each
4. A list of detached syllables (also called nonsense words) will be given to students that they will be expected to complete every day this week. Students will be taught the strategy of “finger tapping” (e.g., t-u-p, sh-u-n, t-r-e-p, g-r-a-p, and d-r-i-t) sounds in words they have difficulty reading.

5. Students will be given a series of words with missing vowels. They will be asked to fill in the appropriate vowel sound. For example, the words will look like, th_n, gl_d, fr_g, ch_p, and gr_n. Students will be expected to fill in the correct vowel sound for each word dictated by the instructor. These skills will be practiced each day of the week for mastery of short vowel sounds.

6. The workbook of focus for this week will be entitled Explore the Code – Book 2 by Educators Publishing Service and Multisensory Learning Associates Workbook – Book 2. Students will complete one page each day in accordance with the vowel of focus along with practice of consonant blends and consonant digraphs. On the final day of study for this learning concept, students will complete activities on the technology software program entitled Lexia – Primary Reading. The instructor will enable only the reading and spelling activities that focus on short vowel sounds, consonant blends, and consonant digraphs.

7. Sounds, Words, and Sentences for dictation will consist of the following:
Monday: a, clap, drag, pals, Dad had an ax. The crab bit the man. (1 sound, 3 words, 2 sentences)
Tuesday: a, e, sh, them, shed, when, Jen went in the shed. (3 sounds, 3 words, 1 sentence)
Wednesday: a, e, i, slip, skin, twin, Brit had a thin twin. (3 sounds, 3 words, 1 sentence)
Thursday: a, e, i, o, u, thud, shut, chop, Don had fun on the drum. (5 sounds, 3 words, 1 sentence)

   A. Teacher says the word out loud to the students.
   B. Students repeat the word.
   C. Students state the letters in the word dictated by the teacher.
   D. Students say each letter in the word as he/she writes the word on paper. Once students transition to sentence writing, they will be expected to repeat the sentence out loud although write the actual sentence independently.

8. Each day throughout the week, the students will read a decodable text from a series entitled Primary Phonics. They will read these books following each spelling dictation activity. The sequence of books throughout the week will be as follows:
Monday: The Cab
Tuesday: Kim and Wag
Wednesday: The Van and the Hot Rod
Thursday: Del
Friday: The Wet Pup

9. Students will be given a list of word cards with short vowel sounds and they will have to categorize these words on a pocket chart. The pocket chart will have 5 columns - one for a, one for e, one for i, one for o, and one for the short u vowel sound.

10. Mats containing short vowels will be distributed on the floor. The teacher will state a short vowel sound and the student will be required to jump on the letter that states the sound the teacher says out loud. This process will be repeated several times and allow for reinforcement of short vowel skill practice. They will also be asked to build words with consonant cubes (e.g., consonant blends, consonant digraphs), and short vowel sounds (e.g., chat, think, shock).

11. Reinforcement Games that will be played throughout the week to review vowel sounds, consonant blends, and consonant digraphs will consist of Memory (matching words to
Week 2 Unit of Study: Words with the Silent E Pattern

Rationale: In accordance with the Common Core State Standards, students are expected to be able to distinguish between short and long vowel sounds as well as apply these in the context of oral reading and spelling.

Common Core Standards:

Phonics and Word Recognition:

- **CCSS.ELA-Literacy.RF.2.3**: Know and apply grade-level phonics and word analysis skills in decoding words.
- **CCSS.ELA-Literacy.RF.2.3.a**: Distinguish long and short vowels when reading regularly spelled one-syllable words.
- **CCSS.ELA-Literacy.L.2.2.d**: Generalize learned spelling patterns when writing words (e.g., cage → badge; boy → boil).

Materials: Wilson Magnetic Board, silent e videos on computer, Wilson Workbook, computer, sound cards, slant board, sandpaper, reading lists, decodable texts consisting of words with the silent e pattern, Multisensory Learning Associates Reader, learning games, and Lexia computer program.

Objectives: Students will be able to read and spell silent e words in isolation, in the context of oral reading, and in the context of written language conventions with accuracy (as measured within educational plans).

Procedures:

1. The teacher will present phonogram cards of silent e words. They will look like as follows: a-e, o-e, e-e, i-e, u-e. The teacher will have a keyword under each VCE pattern (e.g., cape, bone, Pete, kite, and mule). The teacher will review the procedure of saying “a-consonant-e, o-consonant-e, e-consonant-e, u-consonant-e, and i-consonant-e.” She will read the words on the board to her students. As the teacher is reading the words, she will draw an arrow from the silent e to the long vowel sound to reinforce that the e is magical because it makes the vowel before it say its own name. She will then state: “VCE stands for Vowel (V), followed by a consonant (C), followed by a silent e (E). The first vowel in a VCE syllable always has a long sound and silent e is always at the end of word (e.g., make, joke, pine). The silent e is commonly referred to as awesomely powerful e. The e at the end of word is an important letter because it is considered to be the letter which is the helper of the word. The silent e is also considered magical because it has the ability to make the vowel before it say its own name. Examples of silent e words include tape, bite, eve, home, and cute.” The teacher will model how to read words with the silent e pattern.

2. Each day, students will read word lists with the silent e syllable type (taken from Wilson Student Reader – Book 4). Students will be encouraged to finger-tap silent e words if they have difficulty decoding these words. Students will practice writing silent e words on sandpaper and slant boards. The teacher will dictate a word and students will be expected to write the silent e word (e.g., plate, dive, mule, eve, and fume).

3. Each day, students will engage in a decoding fluency drill where they will be asked to read detached syllables (nonsense words) in Wilson Workbook Reader – Book 4. The teacher will
model reading a list of detached syllables (nonsense words) and then the students will be expected to read these words every day to practice phonemic decoding fluency of silent e words.

4. Each day, students will read 15 words of detached silent e syllable types. Students will listen to a different silent e song Monday – Wednesday to practice the silent e-pattern. Monday students will listen to the Silent E Song on www.teachtube.com, Tuesday students will listen to the Electric Company Silent E Music Video (http://www.pbskidsgo.org/electriccompany), and on Wednesday students will listen to That Magic E with Miss Jenny (www.edutunes.com).

5. Students will complete a spelling dictation of sounds, words, and sentences consisting of silent e words. The procedure will look like as follows:
   A. Teacher says the sounds/words out loud to the students.
   B. Students repeat the sound or word.
   C. Students state the sound or letters in the word dictated by the teacher.
   D. Students say each letter in both the sound and/or word as he/she writes the word on paper. Once students transition to sentence writing, they will be expected to repeat the sentence out loud although write the actual sentence independently with no help from the teacher.

Dictated Spelling Words with Silent e Pattern:
Monday – time, note, ate, Pete, Jane rode her bike. Mike went for a ride home. (4 words, 2 sentences)
Tuesday – wife, make, close, I gave Kate the stone. Jane will stomp on the brake. (3 words, 2 sentences)
Wednesday: cake, mule, home, Steve had a bite of the hot dog. A cube has six sides. (3 words, 2 sentences)

6. Each day, students will read a decodable book containing silent e words. The scope will be as follows:
   Monday: The Big Game
   Tuesday: Slide
   Wednesday: The White Hen
   Thursday: Silent E Reading Passage from Multisensory Learning Associate Reader (Book 3)

7. On Friday, students will complete sorting words with short vowel sounds and words with the silent e pattern through a program entitled Lexia – Primary Reading Level. The instructor will enable the level of Lexia that focuses on distinguishing between short and long vowel sounds (e.g., at-ate, bit-bite, cap-cape, pet-Pete, cut-cute). The teacher will continually point out that when you add a silent e to the end of a word it changes the vowel from being short to long. Students will then review all sound cards and state key words for each sound (i.e., a-e, i-e, e-e, o-e, and u-e).

8. Next, students will play the silent e game of I Have, Do you Have? In this game, students are dealt cards with short vowel words and silent e words. Each person will get 7 cards. The goal is to match as many pairs of short vowel-silent e words as possible. For example, the student may say to the teacher “I have pin - do you have pine?” The goal is to practice recognizing words that have short vowels and distinguishing between these words and words that have the silent e pattern – as well as applying the correct strategies to sounding out these words accurately. The culminating activity on Friday will be when the teacher disseminates a list of word cards to students. Students will be asked to sort words on cardstock for each silent e pattern (e.g., a-e: cape, made, trade, e-e: eve, Pete, Steve, i-e: pine, Mike, dive, o-e: home, vote, tone).
## Week 3 Unit of Study: Words with Vowel Teams (also referred to as Double Vowels and Vowel Diphthongs)

**Rationale:** Students are required to exhibit knowledge of words containing the vowel teams oa, ee, ea, ai, and ay in reading and spelling in accordance with second grade common core state standards.

**Common Core Standards:**

**Phonics and Word Recognition:**

<table>
<thead>
<tr>
<th>CCSS.ELA-Literacy.RF.2.3</th>
<th>Know and apply grade-level phonics and word analysis skills in decoding words.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCSS.ELA-Literacy.RF.2.3.b</td>
<td>Know spelling-sound correspondences for additional common vowel teams.</td>
</tr>
<tr>
<td>CCSS.ELA-Literacy.RF.2.3.e</td>
<td>Identify words with inconsistent but common spelling-sound correspondences.</td>
</tr>
</tbody>
</table>

**Materials:** Wilson magnetic board, Wilson Reader (Book 8), Right Into Reading book, computer, sound cards, bumpy/slant board, reading rods, sandpaper, individual mirrors, rice cups, word cards, reading lists, and decodable texts consisting of words with vowel teams.

**Objectives:** Students will be able to read and spell words with the vowel teams of oa, ee-ea, and ai-ay with accuracy (in accordance with educational plans).

**Procedures:**

1. The teacher will have all phonogram cards out for students to see what sounds they will be practicing for the week (e.g., oa, ee-ea, ai-ay). At the beginning of each session, the teacher will model reading words with a specific vowel team and segment sounds. **Monday** will focus on oa.
   
   The teacher will model the word **g-l-oa-t**. The teacher will explain that there are five letters but four sounds in the word gloat. Also, the teacher will tell students that oa has one sound in the word and that the first vowel does the talking in this sound. Students will then be asked to highlight the oa in words presented on a whiteboard. They will follow up by reading the words, paying attention to each individual sound within the word. **Tuesday/Wednesday** will focus on ee-ea. The same procedure will be repeated by the instructor at the beginning of each session. The teacher will model the words **ea-t, d-r-ee-a-m, b-ee-t, and g-r-ee-t**. Students will be asked again to highlight the sound ee-ea on words presented on a whiteboard followed by reading the words and looking closely as to the letter sequences in words. **Thursday/Friday** will focus on ai-ay. The instructor will initially explain to the students by telling and showing students that the sound ai is always at the beginning or middle of a word and the ay is at the end of a word. Again, students will be asked to highlight the sound ai-ay, read the words, and then sort the ai-ay words (giving attention to position of the ai and ay in words).

2. Each day, the second instructional activity will consist of reading words with vowel teams on word cards. Monday will focus on reading words with oa, Tuesday and Wednesday will consist of reading words with the vowel team ee-ea, and Thursday and Friday will be ai-ay word reading. Word cards will be teacher-generated.

3. Students will practice writing oa words on bumpy boards (Monday), ai-ay words on sandpaper (Tuesday/Wednesday), and ee-ea words in rice cups (Thursday/Friday) to apply the kinesthetic modality of hand manipulation when writing sounds. Students will also pay attention to their mouth movements in individual mirrors to practice the sound of focus.

4. Each day, students will engage in a decoding fluency drill where they will be asked to read
detached syllables (nonsense words) in Wilson Workbook Reader – Book 8. Monday: oa. Tuesday/Wednesday: ee-ea. Thursday/Friday: ai-ay. They will read a list of nonsense words to build fluency practice of the vowel team being focused on for that day. This spelling dictation will occur each day. The spelling dictation will consist of sounds, words, and sentences consisting of the oa pattern, ee-ea pattern, and ai-ay pattern. The spelling dictation will look like as follows:

A. Teacher says the word out loud to the students.
B. Students repeat the word.
C. Students state the letters in the word dictated by the teacher.
D. Students say each letter in the word as he/she writes the word on paper.

Monday - oa: practice writing sound oa, foam, goat, poach, I ate the loaf. Jane saw a toad on a float. (1 sound, 3 words, 2 sentences)
Tuesday/Wednesday - ee-ea: practice writing ee-ea sound, teeth, sheet, mean, beach, Dean went to the beach. The sheet was clean. (2 sounds, 4 words, 2 sentences)
Thursday/Friday - ai-ay: sound practice of ai-ay, rain, day, paint, tray, Jay may wait in line. Ray will play with paint. (2 sounds, 4 words, 2 sentences)

5. Each day, students will read a decodable book containing words with vowel teams. The scope will be as follows:
Monday: The Goal (oa sound practice)
Tuesday: The Dream (ee-ea sound practice)
Wednesday: Continuation of The Dream (ee-ea sound practice)
Thursday: Sail (ai-ay sound practice)
Friday: Continuation of Sail (ai-ay sound practice)

6. On Thursday, students will participate in vowel team activities on the computer program entitled Lexia. The instructor will enable Lexia - Primary Reading Level - that focuses on oa, ee-ea, and ai-ay words.

7. The book that will be used for this week’s unit of study will consist of Right Into Reading - Level 2. Monday will focus on a page of oa (i.e., fill in the blank with oa words given sentences), Tuesday and Wednesday will focus on ee-ea (i.e., vocabulary matching), and Thursday/Friday will focus on ai-ay (i.e., highlighting words in sentences).

8. A culminating activity of a teacher-made game of Memory on Friday will be played incorporating oa words, ee-ea words, and ai-ay words. There will be words displayed on blue color-coded cards and definitions placed on yellow color-coded cards. Students will be asked to pick a blue color-coded card and yellow color-coded card to see if they can find a match. For example, if a student picked the word sail - the matching definition would be – it is on a boat. The student with the most number of matches wins the game.

**Week 4 Unit of Study: R-Controlled Words**

**Rationale:** The purpose of this unit of study is for students to be able to understand the relationship and distinguish between r controlled syllables in words in isolation as well as within the context of oral reading. In accordance with the Common Core State Standards, students are required to apply spelling words containing the r-controlled syllable types of ar, or, ir, er, and ur.

**Common Core Standards in Relation to Second Grade Curriculum:**

**Phonics and Word Recognition:**
**CCSS.ELA-Literacy.RF.2.3.e**
Identify words with inconsistent but common spelling-sound correspondences.

**CCSS.ELA-Literacy.RF.2.3.f**
Recognize and read grade-appropriate irregularly spelled words.

**Materials:** Multisensory Learning Associates Workbook, vowel circle chart, word cards, Wilson Reader, Recipe for Reading Workbook 5, magnetic boards, sandbox, sound cards (ar, or, ir, er, and ur), individual mirrors, phonetically-controlled texts, Lexia computer program, and learning games for reinforcement of r-controlled syllable type.

**Objectives:**
Students will master how to read and spell words that have the r-controlled syllable types of ar, or, ir, ur, and er with accuracy (as measured by educational plans).

**Procedures:**
1. At the beginning of each instructional session, the teacher will review the r-controlled syllable type by stating that it is referred to as “Bossy R” because the “R” within the word takes over. The teacher will also emphasize the vowel ALWAYS precedes the r in these r-controlled words. All r-controlled sound cards will be displayed to show students the letters and corresponding sounds: ar-car, or-horn, er-her, ir-bird, ur-burn. The teacher will model the letters, sounds, and keywords. Students will then be expected to repeat this method, as demonstrated by the teacher through individual mirrors. The vowel circle of LindaMood-Bell will be reviewed, reinforcing what is referred to as “Crazy R’s” based on the fact that the r is the dominant sound within the word.

2. Students will read several words containing the r controlled syllable type on a whiteboard (e.g., car, farm, smart, horse, born, for, stir, bird, shirt, burn, turn, her, and were) for the second activity of each instructional session that week. Students will also read detached syllables of r-controlled words each day (e.g., grar, ter, bir, nor, durn).

3. Following practice of reading r-controlled words on the whiteboard, each day students will read phrases and sentences from Multisensory Learning Associates (Workbook 4) that contain r-controlled words. Students will be required to read 4 r-controlled sentences in the Wilson Reader (Book 7) each day Monday-Friday. Students will be asked to highlight an r-controlled pattern and then categorize each pattern on an individual whiteboard consisting of the r-controlled syllables ar, or, ir, er, and ur. Students will be given a sandbox—the teacher will state an r-controlled sound and students will be expected to write the r-controlled sound in the sandbox.

4. Spelling dictation of r controlled words will consist of ar and or words and sentences on Monday, ir, er, and ur words and sentences on Tuesday, and all r-controlled vowels for the duration of the week. Students will complete a spelling dictation of sounds, words, and sentences. The technique will look like as follows:
   A. Teacher says the sounds/words out loud to the students.
   B. Students repeat the sound or word.
   C. Students state the sound or letters in the word dictated by the teacher.
   D. Students says each letter in both the sound and/or word as he/she writes the word on paper. Once students transition to sentence writing, they will be expected to repeat the sentence out loud although write the actual sentence independently with no help from the teacher.

**Monday:** ar, or, ear, barn, horn, cord, The car has a horn. (2 sounds, 4 words, and 1 sentence)
**Tuesday:** ir, er, ur, girl, perch, burn, charm, stork, The girl had her first turn. Bert went to church first. (3 sounds, 5 words, 2 sentences)
**Wednesday:** ar, or, er, ur, farm, fork, under, shirt, curb (5 sounds, 5 words)
**Thursday:** Corn was on the farm. The bird came north for the summer. (2 sentences)
Friday: The horse let out a big burp. The girl and her pal did a flip and got hurt. (2 sentences)
The workbook of focus for this week will be entitled Recipe for Reading – Workbook 5 from Educators Publishing Service (book focuses on r-controlled vowel patterns).
5. Each day throughout the week, the students will read a decodable text from a series entitled Primary Phonics. The sequence of books throughout the week will be as follows:
Monday: The Go-Cart
Tuesday: The Horse
Wednesday: The Shy Tiger
6. Students will complete Lexia at the end of the week. Reinforcement games that will be played Thursday and Friday following the spelling dictation exercise to review r-controlled syllables will consist of R-controlled Spin (from Florida Center for Reading Research), R-controlled Vowel Bingo (a teacher-made activity), and Rapid R-Controlled Sort (i.e., words will be teacher-generated), where students will be required to sort all r-controlled patterns within word webs (i.e., ar, or, ir, ur, er).

Week 5 Unit of Study: Spelling Generalization of words with ck-k and ch-tch

**Rationale:** In accordance with second grade common core state standards, students are required to learn specific spelling patterns in words and apply this framework within conventions of standard English.

**Common Core Standards:**

**Phonics and Word Recognition:**
CCSS.ELA-Literacy.RF.2.3
Know and apply grade-level phonics and word analysis skills in decoding words.

**Fluency:**
CCSS.ELA-Literacy.RF.2.4
Read with sufficient accuracy and fluency to support comprehension.

**Writing**
CCSS.ELA-Literacy.L.2.2.d
Generalize learned spelling patterns when writing words.

**Materials:** Wilson magnetic board, letter tiles, How To Spell Book, computer, Multisensory Learning Associates Reader, sound cards, slant board, workbook activities, decodable texts consisting of words with spelling rules ck-k-c and ch-tch, cardstock, and vocabulary bingo game.

**Objectives:** Students will be able to read and spell words with the spelling rules and generalizations of k-ck and ch-tch with accuracy (as measured in educational plans).

**Procedures:**
1. The first activity of each instructional session will consist of a review of sound cards a, e, i, o, u, a-e, e-e, o-e, i-e, u-e, ar, or, ir, er, ur, oa, ee, ea, ai, ay. The students will be asked to identify the letters, sounds of each phonogram, and keywords for each phonogram. Students will always have the opportunity to spiral back to previously taught skills in recent weeks to ensure they have retained mastery of past skills taught. The goal is to review all previous phonograms of focus.
2. On Monday, Tuesday, and Wednesday students will focus on the spelling generalization ck-k. The rule on the board (that will be kept on the board for these three days) will consist of the following: (a) words are spelled with a ck after a short vowel sound (e.g., tack, Rick, duck, mock); and (b) words are spelled with a k after a double vowel (e.g., cheek), consonant (e.g., pink), or after a long vowel sound (e.g., cake).

3. On Monday, students will be given a charted list of words without the k and ck. They will be asked to fill in the words with a k and ck. Examples that students will be asked to complete will include the following: ba____, po__e, drin _, loo __, bla __. Students will have an opportunity to practice spelling words with ck and k in accordance with the rule that follows this spelling pattern. Students will then be asked to categorize the words into two columns: one for ck and one for k. They will practice writing words with magnetic letter tiles of k and ck. Next, students will read sentences with k and ck words from Multisensory Learning Associates Reader – Book 4, highlighting the k and ck as well as writing the rule that corresponds to each ck-k word (e.g., the word look is spelled with k because k goes after the double vowel oo). Students will be given the opportunity to read ck-k words with detached syllables Monday – Wednesday (e.g., roke, mook, gack, leke, gake, and neak). Tuesday will consist of reviewing sound cards of ck and k as well as keywords associated with both patterns. Students will begin by completing a page in the How to Spell –Workbook 2, where they will be given a word splash that require coding k and/or ck to words. The teacher will read the word and the students will fill in the sound. An example would be the word “shook.” The word will look like “shoo__.” Students will be required to fill in the spelling pattern that follows the k and ck rule. Students will then complete a teacher-generated cloze sentence exercise, where they will have to read a sentence and fill in the sentence with either k or ck. On Wednesday, students will begin with a review of the ck-k spelling rule and complete a spelling dictation exercise, including sounds, words, and sentences. The spelling dictation will consist of the spelling generalization consisting of ck-k pattern. The spelling dictation will look like:

A. Teacher says the word out loud to the students.
B. Students repeat the word.
C. Students state the letters in the word dictated by the teacher.
D. Students say each letter in the word as he/she writes the word on paper. Once students transition to sentence writing, they will be expected to repeat the sentence out loud although write the actual sentence independently.

Sounds for dictation: k-ck, words: shook, dark, deck, chick, The clock says tick-tock. I could not read the book in the dark. (2 sounds, 4 words, and 2 sentences)
Students will read a passage of ck-k words in Multisensory Learning Associates Reader. They will be able to practice orally reading k and ck words within the context of a passage, with particular attention to the spelling rule of k-ck and how to distinguish spelling words consisting of both spelling patterns. Thursday and Friday will consist of practice of the spelling generalization ch-tch.

The teacher will write the following rule on the board:
Words are spelled with tch after a short vowel sound (e.g., patch, ditch)
Words are spelled with ch when the ch comes at the beginning of a word, after a double vowel, or after a consonant (e.g., chair, peach, bench).

4. Students will be asked to complete a categorizing activity, where they will be given a word on a word card of either ch or tch and state what rule it follows (e.g., ch follows the rule that it comes after a double vowel as in peach). They will be asked to categorize ch and tch words on a large piece of cardstock. Additionally, students will be required to read words with detached syllables to
5. Students will complete a vocabulary matching activity, where they will be required to match the tch or ch word with its appropriate definition.
6. The teacher will dictate a variety of tch and ch words - where students will have to isolate phonemes in words (e.g., change match to patch, change pinch to punch). They will complete this activity with letter tiles on a large magnetic whiteboard.
7. Spelling dictation will consist of sounds ch-tch, pouch, starch, stitch, notch, Jane sat on the bench at the match. Will you teach Chad how to pitch? (2 sounds, 4 words, 2 sentences).
8. Students will read passage in Multisensory Learning Associates Reader - Book 4. They will identify ch-tch words and categorize the ch-tch words given a graphic sorting template.
9. Students will complete ch/tch word bingo. They will be given a bingo board with a variety of ch/tch words. The teacher will read aloud words. Students will be required to find words that match the words that teachers say out loud and put a block on each word. Five ch/tch words in a row equals B-I-N-G-O.
10. On the last day of this weekly unit of study, for the last activity, students will complete a section of Lexia where they will be able to practice reinforcement of spelling activities learned.
Week 1: Instructional Log for Short Vowels with Consonant Blends and Consonant Digraphs

**Oral Reading:** The oral reading skill taught for this lesson consisted of short vowels a, e, i, o, and u in words with consonant digraphs and consonant blends. The definition of a closed syllable (word or part of a word with a short vowel sound that is closed in by a consonant) was taught as well as how it was applied within the context of oral reading fluency skills.

**Spelling:** Students were taught how to spell words consisting of short vowel sounds, consonant digraphs, and consonant blends.

**Percentages of Accuracy in Oral Reading Fluency:**

*Detached Syllable Reading:*
- Student A: 80%
- Student B: 85%
- Student C: 70%

*Isolated word reading:*
- Student A: 80%
- Student B: 85%
- Student C: 70%

*Average of total percentages in detached syllable fluency and oral reading word fluency:*
- Student A: 80%
- Student B: 85%
- Student C: 70%

*Percentages of Spelling Sentences Through Simultaneous Oral Spelling Method:*
- Student A: 75%
- Student B: 75%
- Student C: 60%

**Multisensory, Explicit, and Systematic Strategies:**

**Multisensory:** Finger tapping, carpet mats, bumpy boards, *Sea of Vowel* game, phonogram cards, blend cubes for practice with consonant clusters (e.g., br, cr, fl, gl, etc.) and generating words consisting of short vowels, consonant clusters, and consonant digraphs with phonics dominoes. Multisensory modalities were modeled through the use of elkonin boxes. Each box consisted of a sound - showing students how to blend and segment sounds within words. Teacher modeled defining points of a closed syllable by highlighting short vowels in one color and highlighting consonants at the end of each syllable with another color (words were modeled on board by teacher).

**Explicit:** Teacher directly explained what a closed syllable was to students and modeled what this looked like. She stated to students that a closed syllable has a short vowel sound and is closed in by...
a consonant. The teacher reviewed the spelling of words with vowels in CVC words (i.e., Consonant-Vowel-Consonant). She then reviewed with students how words look when consonant blends and consonant digraphs are added to words with short vowel sounds (e.g., Beth, ship, chat, back, etc.).

**Systematic:** Students began with sounds of short vowels, followed by detached syllable word reading of words with short vowel sounds, followed by sentence reading, and culminating in connected text reading of words with short vowel sounds, consonant blends, and words with consonant digraphs. A technique called *What says?* was introduced, where students were required to recall letter-sound correspondences. Following this activity, dictation of sounds, words, and sentences were reinforced each day to students.

**Learning Behaviors: Average of Time on Task Between Reading and Spelling:**
- Student A: 80%
- Student B: 75%
- Student C: 68%

**Description of Instructions from teacher to Student**

1. **Oral Reading:** The teacher reviewed phonogram cards, where demonstration of letters, sounds, and keywords were used to reinforce short vowel sounds, consonant blends, and consonant digraphs. She explained to students that words with closed syllables always have a short vowel sound and are closed in by a consonant. Several models were presented on board to demonstrate what closed syllables look like. The definition and examples of closed syllables were repeated each day of the lesson. The teacher modeled how to read words with detached syllables (shap, chup, gren, etc.). She stated that these are called “silly words” and “pretend words.” Reverse sound drill: teacher stated sound – students were required to repeat sound – and students matched phonogram sound with magnetic letter that represented the sound. Focus on the “vowel circle,” (derived from LindaMood-Bell) was explained, where students pay attention to their mouth movements to correlate letters with sounds. For example, students were told that i a, and e were considered “smiles” because the mouth positions itself as a smile when students say these particular sounds. The teacher modeled finger tapping of sounds in words, The technique involved tapping index finger to thumb, finger in the middle to thumb, and second to last finger to thumb. These techniques were continually practiced throughout the week.

2. **Spelling:** Teacher modeled spelling words with magnetic letters. This process was repeated by students after demonstration by teacher. The teacher dictated words each day to practice and students were asked to spell these words with their magnetic letters. The teacher had students complete a dictation sheet every day on the *Simultaneous Oral Spelling Method*. The steps consisted of as follows:
   - A. Teacher stated word.
   - B. Students repeated word.
   - C. Students stated letters within word.
   - D. Students said and spelled letters as they wrote them down sequentially.
   - E. Upon teacher sentence dictation, students transitioned to independent sentence writing without teacher guidance to practice the skill taught.

A procedure each day involved teacher demonstration of a sound (e.g., *“What says a, e, o, and u?”*). Students said the sound and found the appropriate sound cube to match the stated phonogram. Students counted letters and sounds in words to observe the difference between the numbers of letters and sounds. While students said letters, they pointed to the corresponding
### Week 2: Instructional Log: Oral Reading and Spelling Words with the Vowel-Consonant-E Pattern

**Oral Reading:** Students read words consisting of the silent e/magic e (i.e., vowel-consonant-e pattern) in isolation and connected text reading.

**Spelling:** Students spelled words with the silent/magic e /vce pattern.

#### Percentages and Accuracy in Oral Reading Fluency and Spelling:

**Detached Syllable Reading:**
- Student A: 80%
- Student B: 85%
- Student C: 70%

**Isolated word reading:**
- Student A: 80%
- Student B: 85%
- Student C: 70%

**Average of total percentages in detached syllable fluency and oral reading word fluency:**
- Student A: 80%
- Student B: 85%
- Student C: 70%

**Percentages in Spelling Sentences Through Simultaneous Oral Spelling Method:**
- Student A: 75%
- Student B: 75%
- Student C: 60%*

*Regarding percentages in spelling, student C had been ill for the duration of the past two weeks, which may have had an overall impact on his performance across the area of encoding.

#### Explicit, Multisensory, and Systematic Teaching Strategies:

**Explicit:** Teacher repeatedly generated this rule on whiteboard: *A magic e syllable has a silent e at the end of the word, and makes the vowel before it say its own name.* Spelling patterns of a-consonant-e, i-consonant e, e-consonant-e, o-consonant-e, and u-consonant-e were presented on board and how to differentiate between these vce words based on the long vowel sound heard (e.g., a-consonant-e words make the long vowel a sound). The teacher continually modeled and reviewed why adding a magic e to the word changes the sound of the vowel (e.g., pin-pine, hat-hate, pet-Pete, hop-hope, cub-cube).

**Multisensory:** Videos on silent e, skywriting of silent e words, writing on slant boards to practice the rhythm of the position of letters in silent e words, sandpaper letter writing of magic e words, and magnetic board writing with letter tiles. Students played the Magic E Game entitled *I Have, Do You Have?* for reinforcement of short vowels and silent e words. Students participated in a Scavenger Hunt of finding the correct spelling of silent e words and practiced segmenting/blending sounds in
magic e words. Additionally, students played the silent e bingo game, and spelled individual letters in silent e words within salt/sand trays. Students practiced the tactile modality of silent e by highlighting magic e words in a controlled text with color-coded highlighting tape.

**Systematic:** Students first reviewed the long vowel sounds that the silent e made along with visual cues that represented sounds. Reading began with practice of sounds consisting of the silent e pattern, followed by detached syllable word reading, and progressed to isolated word reading. Eventually, students moved to connected text reading after extensive review of sounds and words. Students then progressed to spelling of sounds and real words consisting of the silent e syllable type. The culminating activity was independent sentence writing with silent e words.

**Learning Behaviors/Average of Time on Task Between Reading and Spelling:**
- Student A: 80%
- Student B: 78%
- Student C: 65%

**Description of Instructions from Teacher to Student:**

1. **Oral Reading:** The teacher stated why the magic e in a word is called the “awesomely powerful e.” She explained to students the magic e makes the vowel before it say its own name. The teacher asked students to draw an arrow from the magic e to the vowel it names to practice this skill (e.g., in the word mule, the arrow would be drawn from the e to the u). The instructor explained to students how magic e is considered to be the helper of the word since it changes the vowel from short to long. The teacher asked students to segment and blend phonemes in words using elkonin boxes and counters. For example, students used counters (e.g., pennies, buttons) to place in boxes and segment the words *sh-i-n-e, ch-a-s-e, p-l-a-t-e*, etc. The teacher stated that the number of phonemes (i.e., letters) in a word can be different from the number of sounds within a word. The teacher instructed students to complete a word sort, where they had to differentiate between words with short vowels and words with the silent e pattern. Additional activities included demonstration of cloze sentence exercises, where students were required to fill in the blank with magic e words and explanation of why it is called the v-c-e syllable (i.e., vowel-consonant-e). The teacher explained that VCE syllables always have a vowel, a consonant, and end with a silent e. Teacher modeled spelling silent e words with magnetic letters and magnetic boards. She explained that an extra “helper letter” is added to any words consisting of the silent e pattern. Teacher reviewed the finger tapping procedure, where students tapped out sounds in words to determine how many phonemes (i.e., sounds) are in the silent e word. The teacher continually reinforced to students that the silent “e” at the end of the word is very sneaky because it does not make a sound and tells short vowels to say their names.

2. **Spelling:** Teacher demonstrated how to change words with short vowel sounds to magic e words (e.g., *bit-bite, pan-pane, pet-Pete, hop-hope, cub-cube*), focusing on the importance of how the spelling of the word changes when adding the silent e within the word. A procedure *What says?* involved teacher demonstration of a sound The teacher had students complete a dictation sheet on the **Simultaneous Oral Spelling Method.** The steps consisted of as follows:
   - A. Teacher stated word.
   - B. Students repeated word.
   - C. Students stated letters within word.
   - D. Students said and spelled letters as they wrote them down sequentially.
# Week 3: Instructional Log for Oral Reading and Spelling of Vowel Teams **oa, ee/ea, and ai/ay**

**Reading Skill Taught:** Students read words consisting of vowel teams (also known as vowel diphthongs).

**Spelling Skill Taught:** Students spelled words with **oa**, ee-ea, and ai-ay vowel teams.

## Percentages of Accuracy in Oral Reading Fluency:

### Detached Syllable Reading:

- Student A: 75%
- Student B: 75%
- Student C: 80%

### Isolated word reading:

- Student A: 75%
- Student B: 75%
- Student C: 80%

*Average of total percentages in detached syllable fluency and oral reading word fluency:*

- Student A: 75%
- Student B: 75%
- Student C: 80%

## Percentages of Spelling Sentences Through Simultaneous Oral Spelling Method:

- Student A: 75%
- Student B: 75%
- Student C: 70%

## Explicit, Multisensory, and Systematic Strategies:

**Multisensory:** Reading rod vowel team writing (i.e., students constructed sentences with word rods), skywriting of words consisting of vowel teams, writing in paint of vowel teams, and fishing for vowel team game, where students were required to find a match to their vowel team that sounds the exact same (e.g., seal/meet, pail/stay). Furthermore, students were given spelling rods, where they received phonemes of vowel teams. They were asked to generate words with these rods. Students practiced writing vowel teams in paint, by skywriting, and through sand trays as well as practice of mouth movements that vowel teams stated through the use of individual mirrors.

**Explicit:** Teacher explained **oa** in isolation, **ee/ea** in conjunction with one another, and **ai/ay** in conjunction with each other. She explained to students that the first vowel does the speaking within the team. The instructor reinforced that although there are two letters within the team, only one sound is heard. The teacher modeled the skills of **oa**, ee-ea, and ai-ay. The **oa** makes the long sound o, the ee-ea makes the long sound e, and the ai-ay makes the long sound a. Shared practice of these skills were then modeled to students (i.e., students were expected to repeat the process through sound blending individual phonograms). The sequence moved toward guided practice, where students took more responsibility of their own work, although the teacher continued to interact with students and gave feedback based on these skills taught. Finally, students were able to transition to independent practice, where they completed sentences independently.
**Systematic:** Students began with reading isolated words consisting of vowel teams. Students then proceeded to sentence reading of words consisting of vowel teams to reading in the context of decodable texts. Students reviewed the oa vowel team alone. Following practice with the oa vowel team, students progressed to the ee/ea vowel team. The final vowel team of review for this week consisted of the ai/ay vowel team. The sequence was based on learning concrete vowel teams and progressing to vowel teams that were considered to be more complex. Throughout practice of each vowel team, the progression began with sounds, followed to detached syllable reading and isolated word reading, and finally transitioned to connected text reading.

**Learning Behaviors/Average of Time on Task Between Reading and Spelling:**
- Student A: 80%
- Student B: 80%
- Student C: 80%

**Description of Instructions from Teacher to Student:**

1. **Oral Reading:** Each day, the teacher gave a description of a keyword regarding the vowel team of focus for that day and model how to read words of this pattern. She asked students “How many vowels do you see in this word?” Additionally, the instructor told students that a vowel team syllable has a special sound when two vowels go together. The special sound makes the vowel team say only one sound even though it has two letters. Students were asked to match words with pictures consisting of vowel teams for words such as *boat*, *eat*, and *pail*. She then had students complete a cloze sentence exercise, which required students to fill in the appropriate vowel team in a sentence. Students were given two sentences and one picture. They were required to check the correct sentence to the picture that it represents. Additionally, students were asked to highlight words with vowel teams with highlighting tape and/or a highlighter. The teacher asked students to complete sorting activities for ee/ea on the days of focus for this vowel team. Once students transitioned to vowel teams consisting of ai/ay words, they then completed an additional sorting activity, remembering that the ai sound is placed at the beginning or middle of a word and the sound ay is placed at the end of a word. The instructor had students complete a matching vocabulary game consisting of these vowel teams, where students were asked to match a word consisting of a vowel team to the correct definition (e.g., A *sail* goes on a boat). Students made a visual of the word as well as by drawing a picture of it.

2. **Spelling:** Teacher modeled spelling words with vowel teams on whiteboards. She explained to students that vowel teams always have two letters that make up the team. Teacher reviewed the finger tapping procedure, where students tap out sounds in words to determine how many phonemes (i.e., sounds) are in words with vowel teams (e.g., sheet has five letters and three sounds: sh-ee-t). The teacher continually modeled sound segmentation and sound blending of vowel teams throughout the week. A procedure stated *What says?* involved teacher demonstration of a sound (e.g., “What says o,” and the student replies with o-e [o-consonant-e and oa]). Because the silent e sound of o-e was practiced in the previous week, the teacher spiraled back to this skill for review. The teacher had students complete a dictation sheet on the *Simultaneous Oral Spelling Method*. The steps consisted of as follows:
   A. Teacher stated word.
   B. Students repeated word.
   C. Students stated letters within word.
   D. Students said and spelled letters as they wrote, followed by independent sentence writing.
### Week 4: Instructional Log for R-Controlled Syllable Types of ar, or, ir, er, and ur

<table>
<thead>
<tr>
<th><strong>Reading Skill:</strong></th>
<th>Oral reading of the r-controlled syllable type.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spelling Skill:</strong></td>
<td>The spelling skill incorporated r-controlled patterns of ar, or, ir, er, and ur and how to spell words regarding this syllable type.</td>
</tr>
</tbody>
</table>

#### Percentages of Accuracy in Oral Reading Fluency:

**Detached Syllable Reading:**
- Student A: 80%
- Student B: 80%
- Student C: 85%

**Isolated word reading:**
- Student A: 80%
- Student B: 80%
- Student C: 85%

**Average of total percentages in detached syllable fluency and oral reading word fluency:**
- Student A: 80%
- Student B: 80%
- Student C: 85%

**Percentages of Spelling Sentences Through Simultaneous Oral Spelling Method:**
- Student A: 75%
- Student B: 75%
- Student C: 70%

#### Multisensory, Explicit, and Systematic Strategies:

**Multisensory:** Teachers displayed letter cards of bossy r patterns and showed a video on R-controlled patterns for visual modality (*Who is the Boss?* - R-Controlled vowel song), writing r-controlled words in salt trays, writing on bumpy boards, and magnetic board writing with letter tiles of r-controlled words. Students stated the name of each letter, and blended sounds to make words (e.g., p-ar-k, h-or-n, t-ur-n, etc.). Prior to dictation, students were given a spelling support card to determine what r-controlled syllable they needed to spell the word (e.g., for the word *park* the student would need the phonogram card of ar). Students completed an r-controlled word web - where a specific r-controlled syllable type was written in the middle of their word web. One student received ar, one or, and one received the pattern of er. Students were asked to generate three words that corresponded to their r-controlled syllable type (e.g., ar-marsh, or-torn, er-her). Students shared out once they had written down three words that corresponded to their r-controlled pattern. Furthermore, students had the opportunity to look in individual mirrors to practice the movements their mouths make when saying the bossy r sound as in ar-or-ir-er-and ur.

**Explicit:** Teacher stated to students: *An r-controlled syllable type always has a vowel before it and the r is very pronounced in each of these syllable types.* Spelling patterns reinforced that the vowel always comes before the *Bossy R* pattern because the letter *R* is the boss and controls the sounds within words.
**Systematic:** Students began with phonogram cards of r-controlled syllable types, followed by reading isolated words. Students then read words with detached syllables. Eventually, students progressed to sentence reading of r-controlled words to reading in the context of decodable texts consisting of ar, or, er, ir, and ur r-controlled words. Words with ar and or were introduced first since the two sounds were distinctly different. Er, ir, and ur were introduced together since the sounds within these three syllable patterns have the same exact sound structure.

**Learning Behaviors/Average of Time on Task Between Reading and Spelling:**
- Student A: 80%
- Student B: 75%
- Student C: 68%

**Description of Instructions from Teacher to Student:**

1. **Oral Reading:** The teacher explained to students what an r-controlled syllable is and how it was used in words. She stated that the R is considered to be “Bossy” since it really takes over. Additionally, students learned that every r-controlled syllable has a vowel that precedes it (i.e., always comes before the r as in car, more, her, bird, and murmur). The teacher asked students to segment and blend phonemes in words using elkonin boxes and dice. She reminded students that ar, or, er, ir, and ur are considered one sound even though there are two letters in these patterns. The reasoning is because these phonemes only make one sound when they are placed together. Teacher continually modeled these skills during the week and demonstrated how to read r-controlled words on board through segmentation of syllables and practice of phonogram cards consisting of these syllable types. The teacher instructed students to complete a word sort, where they had to differentiate between words with ar and or patterns. Students were then expected to differentiate between er, ir, and ur patterns.

2. **Spelling:** Teacher modeled spelling r controlled words with magnetic letters and magnetic boards, demonstrating the importance of the vowel always preceding the r in these words. The teacher reinforced the combinations that can be made from bossy r words (e.g., charm, turn, shore, whirl, and fern). Phonogram cards of *Bossy R* were reviewed each day. Teacher reviewed the importance of looking at the vowel r team syllable as a one sound unit – sliding a finger under each letter with the goal of blending sounds in words (e.g., b-ar-n, h-er-d, m-ur-m-ur). Teacher demonstrated how to change words with short vowel sounds to r-controlled words (e.g., cat-car, tab-tar, tub-turn, hen-her, bus-burn). A procedure that stated *What says?* involved teacher demonstration of a sound (e.g., What says ar? – students will say “a-r” and find letter rods to match the sound.). Since er, ir, and ur have similar spelling sounds, the instructor gave students multiple opportunities to practice er, ir, and ur along with continued guidance and feedback. The mnemonic taught was “Her bird murmurs” to match a phrase with the sounds that make er, ir, and ur. The teacher had students complete a dictation sheet on the *Simultaneous Oral Spelling Method*. The steps consisted of as follows:
   - A. Teacher stated word.
   - B. Students repeated word.
   - C. Students stated letters and counted sounds within word.
   - D. Students said and spelled letters that represented sounds as they wrote them down sequentially, followed by independent sentence writing.
Week 5: Instructional Log for Spelling Generalization
ck-k and ch-tch

**Reading Skill:** Digraphs and trigraphs: k/ck words and words consisting of ch/tch. A digraph contains two consonants that make one sound and a trigraph consists of three consonants that generate one sound. Ck and ch are considered digraphs and tch is called a trigraph. Students orally read words containing ck/k and ch/tch patterns.

**Spelling Skill:** Students were taught how to spell words with ck/k and ch/tch in accordance with specific spelling rules.

**Percentages of Accuracy in Oral Reading Fluency:**

*Detached Syllable Reading:*
Student A: 80%
Student B: 85%
Student C: 85%

*Isolated word reading:*
Student A: 80%
Student B: 85%
Student C: 85%

*Average of total percentages in detached syllable fluency and oral reading word fluency:*
Student A: 80%
Student B: 85%
Student C: 85%

*Percentages of Spelling Sentences Through Simultaneous Oral Spelling Method:*
Student A: 100%
Student B: 80%
Student C: 80%

**Explicit, Systematic, and Multisensory Strategies:**

**Explicit:** Teacher reviewed the sounds for k/ck and ch/tch. She stated that ck and ch are digraphs (i.e., consonants with two letters), and tch is called a trigraph (i.e., a consonant with three letters). She also told students that although trigraphs have three consonants, they still only possess one sound (i.e., as in digraphs). Spelling rules of ck/k and ch/tch rules were reviewed in the book entitled How to Spell – Book 2. Exceptions to words that break these rules were modeled and reviewed with students as well.

**Systematic:** Students reviewed ck and k for the first two days of instruction (in the sequence of words with k/ck, sentences with k/ck, and passage reading of k/ck days. Ch/tch instruction progressed in the same sequence of ck/k (e.g., word reading, sentence reading, passage reading). Spelling began with sounds, progressed to words, and followed to sentence reading and writing with k/ck and ch/tch words. Students were encouraged to utilize a teacher-generated reference sheet if they needed to refer back to the spelling rules of ck-k and ch-tch.

**Multisensory:** Students practiced skywriting the phonograms of focus, writing words consisting of the k/ck and ch/tch patterns in colored sand trays, and phonogram writing in zip lock paper bags with paint inside - practicing the tactile modality of k, ck, ch, and tch words. Kinesthetic modalities
included writing words containing the ck/k spelling rule and ch/tch spelling rule in sand trays and rice trays as well as a simultaneous oral spelling dictation.

<table>
<thead>
<tr>
<th>Learning Behaviors/Average of Time on Task Between Reading and Spelling:</th>
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<tbody>
<tr>
<td>Student A: 80%</td>
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<tr>
<td>Student B: 75%</td>
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<td>Student C: 68%</td>
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</tbody>
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<tr>
<th>Description of Instructions from Teacher to Student:</th>
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<tbody>
<tr>
<td><strong>1. Oral Reading:</strong> The teacher explained to students that ck is always followed by a single short vowel (e.g., stick, back, luck) and k is always followed by a long vowel (e.g., poke), consonant (e.g., blink), and double vowel (e.g., cheek). The teacher also explained that ck is considered a digraph because it makes one sound (even though it has two letters). Furthermore, the teacher reviewed that there are some exceptions to the rule, and some words with this spelling pattern break the rules that have been learned. These exceptions are known as “outlaw words.” The teacher then reviewed outlaw words. Once ch/tch was reviewed, the teacher demonstrated that this spelling generalization has very similar rules to the k/ck rule. She further explained that ch is always preceded by a consonant (e.g., wrench), a double vowel (e.g., reach), and/or at the beginning of a word (e.g., chair, chin). Students were given daily lists of, ck, ch, and tch words. They were asked throughout the week to read words consisting of these phonogram patterns, highlighting the spelling pattern of focus for that day. Students completed a cloze sentence activity, where they were required to read sentences consisting of k/ck words and ch/tch words. Following reading, students were asked to identify k/ck and ch/tch words with varying colors of highlighting tape. Students then completed a sorting activity, where they sorted k and ck words and ch/tch words through a T-chart. The teacher instructed students to complete a word sort, where they were instructed to place k/ck words and ch/tch words in the correct category in accordance with the rule they had learned. Models were presented on board prior to activity.</td>
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<td><strong>2. Spelling:</strong> Teacher modeled spelling ck/k words and ch/tch words by continually applying the rule that was linked with each phonogram. She then gave words to students and had them fill in the ending in accordance with the rule. Examples included pin___, ba___, pin___, la___ (pink, back, pinch, latch). Students were asked to fill in blank spaces by referring to a graphic organizer of the rules regarding these specific spelling generalizations. The teacher instructed students to review the rules for k/ck and ch/tch on a reference sheet distributed to them. Additionally, the teacher demonstrated how to change words with ck, k, ch, and tch through a word splash in accordance with the appropriate spelling rule. Students were asked to spell a word with ch, tch, ck, or k. The teacher instructed students to take various magnetic letters with a magnetic board. They were asked to fill in the spelling generalization as the teacher stated the word. The teacher stated the words “pack, patch, park, and pinch.” Students were asked to state the reasoning behind why they spelled their words the way they did. A procedure called What says? involved teacher demonstration of a sound (e.g., “What two sounds say /ch/?” – students stated ch and tch and found letter cubes to match the sound). The teacher then gave students words containing the ck/k and ch/tch pattern, where students needed to say each sound in the word and count the sounds in the word. Teacher modeled the structure although reduced it as determined by student accuracy of this skill. Students then completed a spelling dictation called Simultaneous Oral Spelling, where the teacher guided students through the following process:</td>
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<td>A. Teacher dictated a word.</td>
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<td>B. Students repeated the word.</td>
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<td>C. Students stated the letters in the word that represented sounds.</td>
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<td>D. Students said the letters again (collecting corresponding letter cards of the spelling pattern).</td>
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<td>F. Students then transitioned to independent sentence writing of words with the ck/k and ch/tch pattern.</td>
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