

**Investigating the use of a Tier Three Reading
Intervention with Struggling Readers**

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By

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ABSTRACT

This investigation used a one-group pretest-posttest design to examine the relationship between a tier three reading intervention program (i.e., a program designed for students that have failed to respond to regular (tier one) and resource (tier two) supports), and grade-level reading gains, as measured using the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010), for 140 students between grades two and four. All students included in this study began well-below their expected grade-level in reading (i.e., two or more grade-levels below). In order to describe the gains made in grade-level reading ability, the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010) was used pretest and posttest to track reading gains. Results from descriptive statistics, Kruskal-Wallis H tests, Mann-Whitney U tests, t-tests, and a multiple regression were indicative of positive reading gains.

Approximately 74% of participants achieved grade-level reading gains that had the potential to close the reading gap (i.e., 0.75 grade-levels or more as measured using the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010)). These results were similar for all participants regardless of gender, diagnosis status (i.e., garden-variety poor reader, physical disability, and learning/attentional disability) or first language status (i.e., English as an additional language or English). This study provides preliminary evidence that this intervention is improving reading outcomes for tier three students. Moving forward, stakeholders of this division would be encouraged to develop a well-designed, structured mixed-methods research study with standardized assessment measures and planned follow-up.

DEDICATION

This thesis is dedicated to my son and all other children who persevere in the face of adversity.

You are truly inspirational.

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CHAPTER 1: INTRODUCTION

Reading is a language-based act meant to help people become literate, or skilled at using written language to learn, comprehend and be entertained (Duff & Clark, 2011; Torgesen, 2000). Developers of reading programs use various theories (e.g. behaviourism, constructivism, social learning and cognitive-processing) to guide the development of programs (Coltheart, Curtis, Atkins, & Haller, 1993; Ehri, 1995; LaBerge & Samuels, 1974; McClelland, 1988; McClelland & Rumelhart, 1981; Perfetti, 2007; Rogers & McClelland, 2014; Seidenberg & McClelland, 1989; Shiffrin & Atkins, 1969; Stanovich, 1980; Stanovich, 1988).

Understanding various theories and the implications of these theories can influence practice, potentially assisting educators as they make instructional decisions (Tracey & Morrow, 2006).

Tracey and Morrow (2006) suggested that, "...the more lenses educators possess for examining the reading process and instruction, the better equipped they will be to understand, facilitate, and articulate literacy development" (p. xii). In addition, Cunningham and Fitzgerald (1999) discussed the importance of working from a theoretical perspective, explaining that, "you are likely to teach and assess reading in ways commensurate with that outlook" (p. 56).

The English language is not an easy one to learn; approximately 5 000 different spoken syllables are written using an alphabetic system consisting of 26 letters, alone or in combination, to represent those syllables (Snow, Burns, & Griffin, 1998). It is no wonder it takes years to master speaking, reading and writing in English. In particular, beginning readers often struggle because the graphic representations of the letters of the alphabet are "referentially meaningless" and beginners can find phonological awareness to be an abstract concept; however, once a learner is able to understand that letters correspond to sound units

they gain an advantage to understanding this complex system (Snow et al., 1998, p. 22).

Clearly, the process of learning to read is a complex one, as outlined by LaBerge and Samuels (1974), “the journey taken by words from their written form on the page to the eventual activation of their meaning involves several stages of information processing” (p. 293). Some individuals are able to acquire the skill of reading easily, while others struggle. Stanovich (1980) established that, “general comprehension strategies and rapid context-free word recognition appear to be the processes that most clearly distinguish good from poor readers” (p. 32). In addition, developers of reading programs, and educators responsible for reading instruction, must first understand, “one of the prime issues in the study of a complex skill such as reading is to determine how the processing of component subskills becomes automatic” (LaBerge & Samuels, 1974, p. 293).

Prevalent reading theorists, McClelland and Rumelhart (1981), proposed an *Interactive Activation Model* for reading acquisition, outlining several inherent assumptions of this theory. These assumptions included understanding that: (1) processing of perceptual information involves many layers of processing; (2) visual input is processed simultaneously, allowing for several letters to be processed at one time; and, (3) the belief that word-based knowledge is related to incoming word features (McClelland & Rumelhart, 1981). This theory of reading was monumental because, “it moved away from a view of reading as a linear progression and toward depicting the interactive nature of many aspects of the mental work of reading” (Cunningham & Fitzgerald, 1999, p. 51). In addition, this theory posited that, “knowledge, or text meaning is partly constructed through sensing the print and partly acquired through the powers of the mind” (Cunningham & Fitzgerald, 1999, p. 52).

The early work of theorists such as LaBerge and Samuels (1974), McClelland and

Rumelhart (1981), and Stanovich (1980), laid the foundation for modern cognitive theories. Two such theories that evolved from earlier research were the *Parallel Distributed Processing Model* (Rumelhart & McClelland, 1986; Seidenberg & McClelland, 1989), and more recently, the *Dual-Route Model* (Coltheart et al., 1993). These theories have provided the theoretical underpinning of many current reading interventions being implemented and studied.

In light of decades of research in the area of reading instruction, as well as the processes involved in the acquisition of foundational skills, why is it that so many students continue to struggle when learning to read? Statistically, only 2%-6% of students should continue to struggle with reading after receiving adequate support (Torgesen, 2000; Vaughn & Wanzek, 2008); but, Willms (2004) reported that approximately 10% of 15 year-old Canadians could be described as having significant deficits. Eight years after this study the situation improved only slightly and in 2012 the Council of Ministers of Education Canada (CMEC) found that, although Canada performed well in the area of reading compared to other countries, Saskatchewan continued to perform significantly below the Canadian average. With the wealth of research findings in the area of reading, failing to produce proficient readers is unacceptable, and for this reason, effective, timely, research-based interventions should be established and implemented using a systematic approach to ensure all students make gains in reading (Snow et al., 1998).

Students, once two or more years behind in reading, are unlikely to catch up to their peers, even if they are provided additional resource support; a phenomenon known as the Matthew effect or *the poor get poorer* (Al Otaiba, Wagner, & Miller, 2014; Denton, Vaughn and Fletcher, 2003; Stanovich, 1986). The work of Shaywitz (2003) outlined several important features of intense interventions: (a) they typically involve direct and systematic instruction in

phonemic awareness, phonics, spelling, decoding, sight word reading, vocabulary, and comprehension strategies; (b) time is built into the program for practicing new skills; (c) these programs focus on developing fluent readers; and, (d) they expose students to extensive language experiences.

Due to continued high rates of reading failure, a three-tiered Response to Intervention (RTI) approach was introduced to help identify children who were not progressing and to do so early and deliberately (Gersten et al., 2009; Johnson & Boyd, 2012). Within this model, a student not responding to research-based classroom instruction (tier one) or additional resource support (tier two) would then require more intense interventions (tier three) (Gersten et al., 2009; Johnson & Boyd, 2012). Griffiths and Stuart (2013) discussed how tier one instruction incorporates assessment tools to assist educators in quickly recognizing students who are struggling. Once identified, more targeted instruction would be implemented, with the potential of putting tier two intervention programs in place (i.e., delivering instruction in small groups of three to five students per teacher, at least three times per week, for up to 20 weeks) (Griffiths & Stuart, 2013). Students continuing to struggle after attending effective tier two programming would then be candidates for more intense interventions (tier three) which would focus on individualization, frequency, and intensity resulting in a far higher expense (Griffiths & Stuart, 2013).

Research has emphasized the importance of improving several areas of reading, with the most salient being: phonemic awareness, decoding ability, vocabulary development and oral reading fluency (Denton et al., 2013; Foorman & Torgesen, 2001; National Institute of Child Health and Human Development [NICHD], 2000; Shaywitz, 2003; Snow et al., 1998; Stanovich, 1980). The needs of students who have not yet attained the skills required to

become proficient readers must be addressed. Foorman and Torgesen (2001) found that, “children at risk of reading failure acquire reading skills more slowly than other children, but they must acquire the same set of skills to become good readers” (p. 206). Increased student underachievement and a funding model that requires economic efficiency makes it increasingly important to pinpoint the optimal amount of time these intense interventions are required, while realizing statistically significant gains for tier three students (Al Otaiba et al., 2014; Denton et al., 2003).

Statement of Purpose

In North America, the ability to read is held in high regard because it is viewed as essential for economic and social development as well as a key skill that paves the way for success (Snow et al., 1998). The purpose of reading instruction is to provide learners with the tools they need to make sense of the printed word, “there is a pervading sense that the final knowledge which counts most, the meaning of the text, is real and true and exists independently of the reader” (Cunningham & Fitzgerald, 1996, p. 52). Unfortunately, as Torgesen et al. (2001) pointed out, “one of the most daunting and clearly defined current challenges for both researchers and practicing educators is to develop, disseminate, and implement methods for teaching reading that will help all children acquire adequate reading skills” (p. 33).

The ultimate goal of reading instruction for students is to improve their ability to make sense of what they have read and have them reading at, or above, the grade-level expected for their age (McCardle, Chhabra, & Kapinus, 2008; NICHD, 2000; Shaywitz, 2003; Snow et al., 1998). It is promising that Torgesen (2000) found when best reading practice was put in place, more than half of the students not responding to reading instruction could be expected to

meet their age-expected reading outcomes. The current challenge for school systems is achieving this goal in a cost effective and time efficient manner (Al Otaiba et al., 2014; Johnson & Boyd, 2013). It has been argued that students with persistent difficulties learning to read require more intense and individualized programming in order to make accelerated gains (Denton et al., 2013; Gersten et al., 2009; NICHD, 2000; Snow et al., 1998; Torgesen et al., 2001). However, queries abound regarding the duration, setting, and intervention plans that are necessary to ensure these tier three students make reading gains rather than just avoiding further regression (Denton et al., 2013; NICHD, 2000; Ring, Barefoot, Avrit, Brown, & Black, 2012).

This research examined the effectiveness of a tier three reading intervention being used by one urban school division in western Canada. This school division attempted to allocate a large amount of their resource teachers' time to lower the student-to-teacher ratio, individualize instruction for each student, and achieve their primary goal of closing the reading gap for students who continued to significantly underachieve (i.e., those that were two or more grade- levels below their peers as measured by the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010)). Specifically, this study investigated the following research questions:

1. Is there a difference in grade-level reading gains for students based on various demographic groupings (i.e., grade-level, diagnosis status, first language, and gender)?
2. How much of individual grade-level reading gains can be explained by the amount of time (i.e., low, average, high) spent in this tier three intervention program?
3. What is the effect of this tier three intervention on participants' foundational

reading sub-skills between pre- and post-intervention time periods, and is the effect similar for non-responding versus responding students?

4. How much variation of individual grade-level reading gains can be explained by the specific number of sessions attended and gains made in foundational sub-skills (i.e., fluently reading Dolch sight words and ability to spell various common spelling patterns correctly)?

Significance of the Study

The majority of children in western culture learn to read well within the public school system (Blomert and Crépe, 2011); but, for a number of reasons (i.e., poverty, English as a secondary language, learning disabilities, etc.) too many capable students continue to underachieve in the area of reading (Snow et al., 1998). The educational system needs to provide appropriate instruction to students' with reading deficits to ensure better life outcomes. A New Zealand study done by Rucklidge, McLean and Bateup (2009), found a strong correlation between reading failure and identified youth offenders; unfortunately, the greater the deficit in reading comprehension the more serious the predicted offence would be in the future. A longitudinal study conducted by Cunningham and Stanovich (1997) determined that reading outcomes measured in the first grade strongly predicted reading outcomes in senior high-school years. Sparks, Patton, and Murdoch (2013) replicated Cunningham and Stanovich's (1997) study and also found that early print exposure was predictive of growth in reading ability, spelling, vocabulary, listening comprehension, and word decoding. These studies reiterate the importance of early intervention to ensure youngsters have a solid foundation of early reading skills, particularly in the areas of decoding, reading comprehension, and spelling (Cipielewski & Stanovich, 1992; Cunningham & Stanovich,

1997; Sparks et al., 2013).

Special education placement has done little to speed up the rate of learning to read for students two or more years behind their same-age peers; rather, it has simply prevented further regression (Denton et al., 2003; Torgesen et al., 2001). Too many students have fallen victim to poor instruction, making it imperative that effective, timely, research-based interventions are established, and systematically implemented, to ensure all students are making significant gains in reading (Snow et al., 1998; Torgesen, 2007). Supporting students at an early age, with a goal of firmly establishing essential reading skills, through the use of engaging activities has been shown to improve outcomes for students (Cipielewski & Stanovich, 1992; Cunningham & Stanovich, 1997; Sparks et al., 2013).

Teachers need to feel they have support when considering a framework for reading instruction rather than being solely responsible for inventing their own intervention program (Denton et al., 2013). This research will investigate such a framework. Analysis of the data from this intervention program will provide valuable information regarding an approach being used to support students who continue to struggle with reading in spite of previous interventions. This tier three intervention program, being used by a western Canadian school division, is expensive to implement and is labour intense. With such a substantial investment in this program, students need to be catching up to their same-age peers. Gains in foundational reading skills and grade-level reading ability should be statistically significant in order to ensure this school division's resources are being allocated in the most effective manner possible.

Definitions

Some terminology, for the purpose of this research, must be clearly defined as it relates

to reading theory, instructional practice and intervention plans.

English as an Additional Language (EAL) Learner

Immigration is changing the face of North American education and the number of students coming to school with a primary language other than English continues to increase (Snow et al., 1998). The Canadian education system requires that teachers accommodate students with various linguistic needs, but the specifics of this programming have not been mastered (Snow et al., 1998). Snow et al. (1998) highlighted that best practice would dictate that these student's be taught in their primary language while becoming proficient in English; however, this is not easily done given the limited resources available to school systems and the sheer number of various languages now represented in school systems. When considering the various reasons that many students do not acquire the skills necessary to read this is an important factor, but "...limited proficiency in English does not, in and of itself, appear to be entirely responsible for the low reading achievement of these students" (Snow et al., 1998, p. 29).

Garden-Variety Poor Reader

In the document *Preventing Reading Difficulties in Young Children*, Snow et al. (1998) discussed various factors that lead to underachievement in the area of reading. Snow et al. (1998) described individuals not meeting reading expectations as follows, "...poor readers who do not meet the criteria for a reading disability are characterized instead as having garden-variety reading problems (or "general reading backwardness"), arising from such causes as poor instruction, low intelligence, and weak motivation" (p. 88-89).

Intellectual Disability (ID)

The American Psychiatric Association (APA, 2013b) describes individuals diagnosed

with an intellectual disability as suffering from impairments to their mental capacity and everyday adaptive skills (e.g., communication, functional academics, self-direction skills, leisure, social skills, community use, home living, health and safety, and self-care as measured using the Adaptive Behavior Assessment System – Second Edition (ABAS-II) (2008). These low adaptive skills paired with an IQ score of approximately 70 or lower are what distinguish a person diagnosed with an intellectual disability from other students that struggle with learning (APA, 2013b).

Learning/Attentional Difficulties

Attention deficit hyperactivity disorder (ADHD). ADHD has been estimated to affect approximately 5-8% of children (APA, 2013a; Freberg, 2010). The Diagnostic and Statistical Manual of Mental Disorders: Fifth Edition (DSM-V) (APA, 2013a) described ADHD as, "... a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development" (p. 61). This disorder results in problems maintaining attention, organizing materials, controlling impulses, and demonstrating appropriate emotional behaviour (Freberg, 2010), all of which can have detrimental effects on a child's ability to learn.

Specific learning disability (SLD). Historically, many individuals who would have been previously diagnosed as having an intellectual disability are now meeting the criteria of a specific learning disability (SLD) and are now represented to a greater degree (Decker, Hale, & Flanagan, 2013). In order for a student to be diagnosed with an SLD, they must meet specific criteria outlined in the DSM-V (APA, 2013a). The DSM-V (APA, 2013a) describes people affected by an SLD as follows: experiencing persistent learning and academic deficits for a minimum of 6 months; experiencing these problems early in their school careers in spite

of effective interventions; and, experiencing difficulties which are not attributed to another neurological, intellectual disorder, motor disorder, or other external environmental factors.

Non-responder

Students, after receiving intense intervention and instruction, who continue to remain significantly behind their peers in reading are considered non-responders. Wanzek and Vaughn (2008) highlighted that,

Yet despite the wealth of current knowledge in the area of beginning reading instruction, nearly every research study conducted has demonstrated that some students' with reading difficulties continue to struggle, even after receiving effective and intensive interventions that have resulted in overall gains for the majority of students. These students are sometimes referred to as "non-responders," or "treatment resisters." (p. 126)

Fuchs and Fuchs (2005) cited that the most at-risk students are those that fall below the 25th percentile in reading. Therefore, for the purpose of this investigation, those students that made grade-level reading gains below the 25th percentile of other participants were deemed non-responders. Those above the 25th percentile were deemed responders.

Response to Intervention (RTI)

The National Association of School Psychologists (NASP, 2006) defined Response to Intervention (RTI) as, "a multi-tiered approach to providing services and interventions to struggling learners at increasing levels of intensity" (p. 1). Denton (2012) was more specific, describing RTI as a framework operated school-wide, "...through which students at risk for reading difficulties are identified and provided with evidence-based and data-informed instruction and intervention before they fall further behind their peers" (p. 232). Boyd and

Johnson (2012) believed working from this perspective required schools to, “first collect and evaluate data at multiple levels and then to construct prevention systems designed to meet the particular needs of students” (p. 204). During the inception of this approach several tiers of intervention have been proposed; however, “most multi-tiered models of academic instruction are organized along three levels of support referred to as Tiers 1(universal), 2 (targeted), and 3 (intensive)” (NASP, 2009, p. 2).

Significant Reading Gains

Torgesen et al. (2001) found that if educators hoped to close the reading gap for underachieving students, the students needed to be making equivalent, if not accelerated, gains as their peers who were achieving grade-level gains. Torgesen et al. (2001) reported that,

Although reading instruction provided by special education is more effective than general education classroom instruction for children with reading disabilities, current instruction in many special education placements is not sufficient to accelerate reading growth so that there is reasonable hope for these children to achieve average-level skills in a reasonable period of time. (p. 34)

In this investigation, significant reading gains are defined as gains greater than one half a grade-level as measured by the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010) essentially closing the gap between their peers.

Chapter Organization

Chapter 2 contains a review of relevant literature regarding various reading theories, instructional procedures, and intervention programs being used in a tiered intervention framework. Chapter 3 contains a discussion regarding the methodology and analyses of data for this intervention. In Chapter 4, the results from this investigation are discussed. Lastly,

Chapter 5 discusses the results in relation to other intervention models and the implications for future practice.

CHAPTER 2: LITERATURE REVIEW

What follows in this chapter is a review of relevant literature related to reading and the methods of intervention used by educators with students that have not responded to typical reading instruction. Struggling to acquire the skills to effectively read could be due to several factors: an intellectual disability; learning English as an additional language; having a specific learning disability; other disabilities that may interfere with learning (i.e., traumatic brain injury, attention deficit hyperactivity disorder (ADHD), cerebral palsy, etc.); lack of motivation or engagement; socioeconomic status; or, poor instruction (Grabe & Stoller, 2011; Snow, Burns & Griffin, 1998). Teachers attempt to meet the needs of these diverse students by collecting data then providing additional support using an RTI model (Denton, 2012; Gersten et al., 2009; Hunter, 2012; Johnson & Boyd, 2012; NASP, 2009; Torgesen, 2007). A major cause for concern is that, "...while students without disabilities are improving their reading performance, the performance of students with disabilities is declining" (Wanzek & Vaughn, 2014, p. 47). For this reason, it is important that educators are implementing effective instructional approaches, which are both intense and explicit (Nelson-Walker et al., 2013).

A better understanding of the types and amount of intervention required to achieve significant reading gains for students would assist educational stakeholders as they coordinate and plan effective and efficient programming. This is important when considering future outcomes for students that are not literate (e.g., increased likelihood of having a criminal record, higher rates of school drop-out, problems getting and keeping a job, increased levels of emotional stress, and fewer economic opportunities) (Blomert and Crépe, 2012; Rucklidge et al., 2009). Identifying students early and intervening immediately has the potential to improve

these outcomes.

In this chapter, a brief history of reading theory is provided first. Second, assessment considerations are discussed followed by an outline of the foundational sub-skills necessary for the successful acquisition of reading. The Response to Intervention (RTI) approach is explained next, followed by relevant research regarding intervention programs used with struggling readers. Last, an overview of a tier three reading intervention program being used by one urban school division in western Canada is outlined in detail.

Reading Theory

Tracey and Morrow (2006) clarified that, “theories are explanations that are grounded in belief systems usually supported by extensive research and databases, and often held by large groups of people” (p. 2). Theory can be conceptualized as a way to explain or understand how facts are organized and how they fit together; to determine the importance of these facts when developing an understanding of some phenomenon; and, to better understand the significant relationships among the facts (Thomas, 2000). In its simplest and most basic form, “...a theory is an idea” (McCardle, Chhabra, & Kapinus, 2008, p. 9). Schunk (2012) summarized the relevance of theories well when he stated that, “without theories, people could view research findings as disorganized collections of data, because researchers and practitioners would have no overarching frameworks to which the data could be linked” (p. 10).

In education, teachers are faced with diverse groups of learners. Tracey and Marrow (2006), confirmed the importance of using theory to guide educational practice. They wrote:

When teachers become aware of the full range of theories from which their educational practices can radiate, their repertoire of teaching skills can greatly expand. Similarly,

when teachers understand the full range of theories from which instructional strategies stem, they can select those interventions that best suit the particular teaching situation, thus optimizing the effectiveness of their instruction. (p. 5)

Tracey and Morrow (2006) went on to report that, “while teachers possess theories that drive their teaching, they may or may not be able to explicitly describe them” (p. 5), although the instructional methods of delivery often speak to these theoretical underpinnings.

Those in education often look to theories to help understand and explain the way children learn; and, “when a child has difficulty learning to read, for example, one theory (i.e., explanation) is that the cause is related to a cognitive problem” (Tracey & Morrow, 2006, p. 4). Learning is a complex endeavor, and each student arrives at school with a unique set of characteristics that may also factor into their ability to learn (i.e., motivation, language, behavior, and/or social differences) (Tracey & Morrow, 2006). Therefore, when assessing a worthwhile theory, Thomas (2000) recommended that the theory applied to the real world, was clearly written, and was easy to understand. Thomas (2000) added that a theory should explain the past, predict the future, and offer practical suggestions to solve the problem; in addition, it should be testable and provide evidence-based estimates of the true phenomenon, while offering reasonable answers to important questions of practice. Finally, a theory is meant to encourage new research while maintaining the historical importance; ultimately, the theory should simply make sense (Thomas, 2000).

The number of theories regarding child development, learning, and specifically the process by which children learn to read is vast. Theories regarding how people acquired literacy have been documented by great philosophers as early as 400 B.C. (i.e., Plato’s *Mental Discipline Theory*), which considered the brain a muscle that needed to be exercised (Tracey

& Morrow, 2006). Another theory, *associationism* which was linked to Aristotle, had historic roots and promoted the "...idea that things that occur together in time or space tend to become associated in the mind" (Tracey & Morrow, 2006, p. 17). Tracey and Morrow (2006) described how early in the 18th century, theorists began to challenge these ideas; and many claimed that, "...learning was most facilitated through a natural unfolding of the mind based on individual curiosity and interest" (p. 19). Finally, *structuralism*, attempted to, "...prove via the scientific method Aristotle's notion that simple ideas are transformed into more complex ones through the laws of association" (Leonard, 2002, p. 183). Leonard (2002) pointed out that structuralists opposed many ideas and approaches (i.e., unconscious processes and studying animal behavior to better understand human behavior) and for this reason these theories were short-lived.

Behaviourism, prevalent between 1900 and 1950, focused on observable behaviour and learning, and the relationship between a stimulus and a response; often explaining learning as what could be observed (Schunk, 2008; Tracey & Morrow, 2006). Tracey and Morrow (2006) described *behaviourism* as, "... a theoretical perspective on learning that focuses on observable changes in behavior. From a behavioral perspective, the outcome of learning is an observable change in behavior" (p. 33). Schunk (2012) described these theories as able to, "...explain learning in terms of environmental events ... mental processes are not necessary to explain the acquisition, maintenance, and generalization of behavior" (p. 114). In addition, behaviorists depicted the reading process as, "... a complex behavior that could be broken down into component skills" (Tracey & Morrow, 2006, p. 79). A strict behaviourist believed that pleasant and unpleasant consequences could be utilized to manipulate the learner; therefore, they would encourage the use of rewards and reinforcement, along with drill and practice to

realize reading gains (Taylor, Hawkins, & Harvey, 2008). Although some of the ideas seem strict and perhaps dated, educators continue to be influenced by these early behaviourist models (Taylor et al., 2008).

Constructivism, which surfaced in the 1920s, highlighted how people constructed meaning internally (Tracey & Morrow, 2006). These theories were rooted in the belief that, "... learning occurs when individuals integrate new knowledge with existing knowledge. In this theoretical perspective, the integration of new knowledge with existing knowledge can only occur when the learner is actively engaged in the learning process" (Tracey & Morrow, 2006, p. 47). Rather than viewing learning as an act to be observed, as suggested by behaviourists, Tracey and Morrow (2006) explained that constructivists viewed the process of learning as internal, making it difficult for an observer to see what was happening. In addition, constructivist theorists claimed, "... that learning can occur in the absence of observable indicators, that learning often results from a form of hypothesis testing, and that the process of making inferences is central to the learning process" (Tracey & Morrow, 2006, p. 74). Schunk (2012) suggested that the goal of an educational environment classified as constructivist would encourage learning by using real experiences. Schunk (2012) also found that "constructivist classrooms teach big concepts using much student activity, social interaction, and authentic assessments" (p. 275); and when compared to a traditional learning environment, "...there is less emphasis on superficial learning and more emphasis on deeper understanding" (p. 275).

Social learning perspectives, also considered to be constructivist in nature, have been promoted since the 1960s (Leonard, 2002). Tracey and Morrow (2006) outlined how, "when applied to the field of reading, the social learning perspective emphasizes the importance of

social influences and social interaction of literacy learning” (p. 100). Taylor et al., (2008) suggested that these theories, “...enabled educators to better understand how individuals think, how they feel about themselves, and how to become aware of factors in the environment precipitating cognitive and affective problems which may have some bearing on academic performance” (p. 127). Taylor et al. (2008) argued that, “children model and imitate behaviors from their environments” (p. 128); however, the degree of importance of this causal relationship has not been fully established.

Cognitive-based theories began to gain momentum in the 1930s, for example *Piaget’s Stages of Cognitive Development* (i.e., sensorimotor, preoperational, concrete operational, and formal operational) have been used to explain the various stages a child goes through as they develop cognitively (Tracey & Morrow, 2006). These stages have continued to maintain relevance even today, providing educators with an understanding of how children acquire knowledge; thereby, allowing them to generate relevant and developmentally appropriate learning opportunities (Tracey & Morrow, 2006). Schunk (2008) described cognitive theories as those that, “...stress the acquisition of knowledge and skills, the formation of mental structures, and the processing of information and beliefs” (p. 22). It logically follows that, “a cognitive processing perspective on reading seeks to describe the workings of the mind during the reading process” (Tracey & Morrow, 2006, p. 148). The most salient feature of cognitive theories was the emphasis on making meaning of what was learned, as well as an awareness of the educational environment in relation to themselves (Schunk, 2008).

An evolution of the cognitive perspectives began in the 1950s when researchers began to dissect how information was processed (Tracey & Morrow, 2006). Between the 1950s and 1970s cognitive psychologists began to investigate the processing of information as a “discrete

symbol-processing system,” comparing it to a computer program that could use a list of rules applied to incoming information (Rogers & McClelland, 2014, p. 1025-6). Gabe and Stoller (2011) described how Information/Cognitive Processing Models were often classified as, *bottom-up*, *top-down*, or *interactive* in nature, and that these models were, “...metaphorical generalizations that stem from comprehensive research ...” (p. 25). The *bottom-up* models of reading are somewhat mechanical in nature and are based on simple identification of letters, sounds and words, depending very little on the readers’ ability to draw on previous knowledge, or to make inferences (Gabe & Stoller, 2011; Tracey & Morrow, 2006).

In comparison, Tracey and Morrow (2006) discussed how *top-down* models of reading relied heavily on the plethora of background knowledge that a reader possessed (i.e., sentence and text structure, word meanings or vocabulary, and letter-sound correspondences) to predict and make hypotheses as they read. Models of this nature have been criticized for relying too heavily on the reader’s background knowledge and inferences; perhaps for this reason, Gabe and Stoller (2011) questioned how much a reader could gain from a text if they were expected to have background on all the information contained within that text. Tracey and Morrow (2006), described that it was not appropriate to consider *interactive* models either *bottom-up* or *top-down* because the processing involved in these models was complex, and was described as follows;

The simultaneous processing of syntactic information (referring to word order within sentences), semantic information (related to message construction), orthographic information (related to visual input), and lexical information (referring to word knowledge) allows for higher level and lower level processes to mutually interact during the reading process. (p. 150)

An *interactive* model, according to Stanovich (1980), assumed that during the reading process, "... a pattern is synthesized based on information provided simultaneously from several knowledge sources" (p. 63). McClelland and Rumelhart (1981) assumed that, "...perception is fundamentally an *interactive* process" (p.377-8). They went on to discuss how *top-down* processing worked in partnership, and at the same time, as *bottom-up* processing "... to provide a sort of multiplicity of constraints that jointly determine what we perceive" (p. 378). Tracey and Morrow (2006) reinforced this position, stating that, "...during the reading process there are many times in which higher level processing (such as comprehending the meaning of a sentence) assists in lower level functions (such as word identification)" (p. 138).

Stanovich (1980) extended the *Interactive Model* and proposed the *Interactive-Compensatory Model*. Based on this version of the model, Stanovich (1980) stated that,

The compensatory assumption states that a deficit in any knowledge source results in a heavier reliance on other knowledge sources, regardless of their level in the processing hierarchy. Thus, according to the interactive-compensatory model, the poor reader who has deficient word analysis skills might possibly show a greater reliance on contextual factors. (p. 63)

Stanovich (1980) went on to explain that over-reliance on context as a compensatory strategy was detrimental to comprehension because of the amount of energy and attention that was diverted to that compensatory skill. Simply put, if one process did not work, another of the processes would compensate (e.g., if a word was unknown the reader may use context clues to attempt to figure it out) (Gabe & Stoller, 2011; Tracey & Morrow, 2006).

Another cognitive-based theory that garnered much attention, the *Information*

Processing Model (Shiffrin & Atkinson, 1969), was rooted in memory. Shiffrin and Atkinson (1969) suggested that information moved through three distinct memory storage systems (i.e., sensory register, short-term, and long-term storage). Tracey and Morrow (2006) discussed how the sensory register could only hold and process information for a few seconds before moving it to a temporary storage area (i.e., short-term memory) to be processed. It was hypothesized that this information would diminish if not attended to (e.g., use of rehearsal) within 30 seconds (Shiffrin & Atkinson, 1969). Shiffrin and Atkinson (1969) pointed out that a portion of this information would transfer over to more permanent, long-term storage, where it was believed to remain indefinitely; although, retrieval of that information could vary greatly among individuals. For several decades, information processing models, such as the *Information Processing Model*, have continued to dominate and influence learning and memory research (Tracey and Morrow, 2006).

Several years later, LaBerge and Samuels (1974) proposed the *Automatic Information Processing Model*, which was also considered a, "... "bottom-up" processing model because it represents the reading process as beginning with the processing of graphic stimuli (the "bottom" of the process) and proceeding to higher levels of cognitive processing (the "top" of the process)" (Tracey & Morrow, 2006, p. 137). Operating from this perspective, it was believed that a reader would first need to learn to decode fluently, before they could be expected to fully comprehend what was read (Tracey & Morrow, 2006). LaBerge and Samuels (1974) suggested that students be given easier text so that less attention would be dedicated to decoding; therefore the student, upon re-reading the text, could dedicate their full attention to comprehension. Another way that energy could be freed for comprehension was through efficient sight word reading; and Ehri's (1995) *Orthographic Processing Perspective*

investigated how visual features of words led to acquiring sight words.

Specifically, Ehri's (1995) *Orthographic Processing Perspective* investigated how visual print, or orthographic information, was processed while individuals read. From this perspective, readers began in the pre-alphabetic phase, not knowing many letter-sound correspondences and they relied heavily on non-alphabetic, visual features to remember words (Ehri, 1995). Once the learner began to acquire various spelling patterns, letter-sound correspondences, and vowel spellings their sight word banks began to grow quickly (Ehri, 1995). This phase was followed by the ability to consolidate recurring, larger units of letters; thereby, expanding the readers' ability to efficiently learn sight words (Ehri, 1995). More recently, Ehri (2009) described sight word learning as a "...connection-forming process that bonds spellings to pronunciations in memory" (p. 184). In comparison, Perfetti (2007) proposed a theory that was more dependent on a person's ability to hear and understand words.

Perfetti (2007) discussed how the *Verbal Efficiency Theory*, developed in the mid-80s, operated from some basic tenants. A person's ability to identify words and then continue on to successfully comprehend what was read was central to this theory; differences among individual's ability to do this would affect the level at which they were comprehending written material (Perfetti, 2007). Tracey and Morrow (2006) outlined three assumptions of the *Verbal Efficiency Theory*: first, the ability to read text was tied to how a person heard the text; second, speed and fluency of reading was directly related to how well the person knew the words; and third, decoding ability affected how fast a person could read isolated words. Perfetti (2007) found this theory posited that, "...word identification, the rapid retrieval of a word's phonology and meaning, was a limiting factor in comprehension" (p. 358). Perfetti (2007) also highlighted that speed and efficiency were not synonymous; and, believed it was

more important for readers to be able to, "...retrieve word identities that provide the meanings the reader needs in a given context" (p. 359).

As research regarding reading theory grew, so did information regarding the reading process, which led Stanovich (1988) to intensify his examination of readers that had been coined *dyslexic* using an *IQ-discrepant* model (Tracey & Morrow, 2006). These were individuals that read below what would be predicted based on their IQ score (Tracey & Morrow, 2006). This model led to the development of the *Phonological-Core Variable Difference Model* (Stanovich, 1988). Stanovich (1988) argued that the main difference between a normal reader and a reader with dyslexia was their proficiency in the area of phonological knowledge. This important distinguishing factor was then incorporated into Stanovich's (1980) earlier work that found, "... general comprehension strategies and rapid context-free word recognition appear to be the processes that most clearly distinguish good from poor readers" (p. 32), allowing educators to appropriately plan for their students with reading disabilities.

Gabe and Stoller (2011) recognized that the majority of the modern theories addressing word recognition had been rooted in primarily *bottom-up* connectionist theories. McClelland (1988) explained that connectionist models were "...truly active, in the sense that they give rise to further processing activity directly....and takes action on the basis of the results of this examination" (p. 108). Scientifically, Gabe and Stoller (2011) summarized connectionist theories as a process in which, "... information in our brains is composed of millions of bits of neuron networks that create larger neural networks representing a given lexical item, or a given concept, or non-verbal information" (p. 28). Stimuli enter connectionist systems and are coded as input, then an output response follows, and this process continues to repeat itself until a

correct response is produced (Beaton, 2004). Two main ideas that McClelland (1988) claimed guided the investigation of connectionist theories were,

(1) the idea that processing in a multilayered processing system is continuous, so that information accumulates gradually over time and is propagated as it builds up, and (2) the idea that this kind of continuous processing may be interactive, so that influences can be bidirectional, flowing both from higher to lower levels and from lower levels to higher levels. (p. 115)

Beaton (2004) stated that, “by their very nature, connectionist models provide an account of how associations are established between orthographic input and phonological output. In short, they learn over time. That is what children do; they do not become skilled readers immediately” (p. 33).

The *Parallel Distributed Processing (PDP) Model* (McClelland, 1988) was an example of a connectionist model that stressed, “...the notion that processing activity results from the processing interactions occurring among rather large numbers of processing units” (p. 108). Rogers and McClelland (2014), when considering the *PDP Model*, stated that, “...cognitive processes and representations are like beehives: They often have quite regular and elegant structure that may appear to reflect accordance with some set of rules or principles of design...” (p. 1034). Furthermore, the *PDP Model* presents processing as interactive and dynamic; evolving over time (Rogers & McClelland, 2014).

Tracey and Morrow (2006) outlined two main features of the *PDP Model*, first, “...all cognitive information is stored as a series of *connections* between units” (p. 164), and second, the “...connections between units becomes stronger and faster with repeated pairings” (p. 164). When considering the reading process from this perspective, Tracey and Morrow (2006)

outlined four areas that successful readers depend on when reading (i.e., automatic letter recognition, accurate phonemic processing, strong vocabulary knowledge, and the ability to construct meaningful messages (comprehend) during reading). These areas were labeled: orthography, meaning, phonology and context (Seidenberg & McClelland, 1989).

The orthographic processor was the entry point at which recognition of print occurred, beginning with letters and numbers and eventually words; it was believed that with repeated practice these connections became faster and stronger until they could be considered automatic (Tracey & Morrow, 2006). The second processor, delivered and received information with all other processors in the model and was termed the meaning processor, which "...attaches the meaning (vocabulary) to words identified in the orthographic processor" (Tracey & Morrow, 2006, p. 167). Tracey and Morrow (2006) pointed out that these meanings were then organized based on connections to the individual's background knowledge (or schema) and experience, growing as people aged. Third, the phonological processor allowed the individual to process the sounds that were tied to the words in their smallest form, the unit known as the phoneme (Tracey & Morrow, 2006). The final processor in this model was the context processor, "where the reader constructs and monitors the meanings of phrases, sentences, paragraphs, and full texts during the reading process (Tracey & Morrow, 2006, p. 168). This processor was responsible for delivering and receiving new information and constructing the message, and Tracey and Morrow (2006) stated that this allowed for accurate predictions of what would come next in the text.

Rogers and McClelland (2014) explained that an advantage of the *PDP Model* was that it allowed researchers to distinguish how early learners began to gain cognitive competence, and to understand how cognitive changes occurred over time and why these

changes happened, which was imperative when attempting to dissect the complex task of learning to read. They went on to discuss how, "...competence is always a matter of degree, partial success in less demanding situations followed by greater robustness naturally emerges within the PDP framework" (Rogers & McClelland, 2014, p. 1049).

A final model that Tracey and Morrow (2006) stated was prevalent in reading research was the *Dual-Route Model* (Coltheart et al., 1993). The *Dual-Route Model* (Coltheart et al., 1993), although similar in many ways to the *Parallel Distributed Processing Model*, does have distinguishing features. Within this model, Coltheart et al. (1993) claimed the reader had two options for converting text to speech, "...a dictionary lookup procedure and a letter-to-sound rule procedure" (p. 589). When considering the first option (i.e., the lexical route), words were processed, as a whole, by accessing the visual memory, and this was followed by production of a pronunciation based on a familiar structure of the word (Beaton, 2004). Beaton (2004) explained that the second route (i.e., the sub-lexical route) was used with non-words, because the reader had no memory of the word, therefore they were required to decode smaller units or strings of letters.

A more recent computational model that has expanded on this idea has been called the *Dual-Route Cascaded (DRC) Model*, which claimed that once the system was activated, the flow would continue on to subsequent levels regardless of some threshold being reached (Beaton, 2004). Coltheart et al., (1993) discussed how the lexical route "...will succeed when the input string is a word but will deliver no output when it is a nonword..." (p. 368) which can be contrasted to the sub-lexical route which "...will deliver correct output when the input string is a nonword or a regular word and will deliver an incorrect output....when the input string is an exception word" (p. 368).

When considering various theories and models it is important to remember that, “models are not people and do not behave exactly like them. Insights arise from analyzing where and why they differ, and whether the differences are relevant to any given issue” (Seidenberg & Plaut, 2014, p. 1214); therefore, it is important to remember that each student will come prepared with a unique set of skills and background knowledge. Snow et al. (1998) pointed out that,

Reading skill is acquired in a relatively predictable way by children who have normal or above-average language skills; have had experience in early childhood that fostered motivation and provided exposure to literacy in use; get information about the nature of print through opportunities to learn letter and to recognize the internal structure of spoken words, as well as explanations about the contrasting nature of spoken and written language; and attend schools that provide effective reading instruction and opportunities to practice reading. (p. 4)

Clearly, theories and models of reading development have continued to evolve since very early times. As researchers continue to make important discoveries about the brain, and how people learn, this field will continue to grow and change.

Seidenburg and Plaut (2014) pointed out the importance of remembering that, “models are tools for investigating theoretical principles and empirical phenomena. Every model only partially instantiates the principles in question and addresses only some of the phenomena” (p. 1212-3). Reading research often draws on knowledge from more than one theory to explain the process of learning to read; and, “...every model is literally and inherently false at some level of detail” (Seidenberg & Plaut, 2014, p. 1213). For this reason, it is important to get a complete overview of the relevant theories that influence reading instruction.

The intention of reading instruction is to enable students to read, and comprehend what is read, at the same level that they understand spoken language (Duff & Clark, 2011; Torgesen, 2000). Although reading is not a natural part of human development, Blomert and Crépe (2012) found that approximately 90% of students were able to acquire the skills necessary to read without experiencing problems. The conundrum for educators is - what to do when students struggle with learning to read, and how to determine where the breakdown has occurred? The first step required is an assessment of what the student can and cannot do.

Assessment Considerations

Assessment of learning can be formal or informal. Leslie and Caldwell (2009) provided a definition of informal assessments "...as assessments that do not interpret scores using comparative or normative data or employ standardized procedures for administration and scoring" (p. 410), although they often have "...an informal protocol to follow" (Walker, 2008, p. 135). In contrast, "formal assessments are administered under standardized conditions to measure reading and writing achievement, a product of learning to read and write" (Walker, 2008, p. 135). These standardized assessments provide information regarding how students are performing in comparison to others their age, Walker (2008) explained that, "the tests give you a score that is based on the standardization sample so that a diagnostic teacher can measure such things as yearly progress" (p. 138). Standardized tests meet "... empirically-based standards of reliability and validity required by policy makers and administrators" (Dougherty Stahl, 2009, p. 429); however, Leslie & Caldwell (2009) critiqued these measures, finding that "...the tests were not valid indicators of the students' ability to reliably demonstrate the skill in a wide variety of contexts" (p. 405).

Formal assessments in reading "...normally consist of a vocabulary and

comprehension subtest” (Walker, 2008, p. 138). Overall reading achievement is often assessed using standardized measures such as the: *Gray Oral Reading Test*: fourth edition (GORT-4; Wiederholt & Bryant, 2002); *Woodcock-Johnson Tests of Achievement* (WJ-R ACH; Woodcock & Johnson, 1989); *Woodcock Reading Mastery Test* (WRMT-R/NU; Woodcock, 1987); *Woodcock-Johnson Tests of Achievement*: third edition (WJ-III ACH; Woodcock, McGrew, & Mather, 2001); *Test of Word Reading Efficiency* (TOWRE; Torgesen, Wagner, & Rashotte, 1999); and, the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Good & Kaminski, 2001) just to name a few.

One specific example, the WJ-III ACH (Woodcock et al., 2001), is a standardized measure that provides an overall reading score which is composed of six subtests: (1) letter-word identification, which examines the ability of the participant to decode; (2) reading fluency, which requires the student to read sentences quickly, then answer true or false questions about them; (3) passage comprehension, which entails reading a short selection then determining missing words from the text; (4) the word attack subtest measures the participants ability to decode nonsense words that are phonetically regular; (5) a reading vocabulary subtest, which requires the student to consider analogies, antonyms, and synonyms; and finally (6) the sound awareness subtest, which measures the ability to manipulate and analyze phonemes (Mather, Wendling, & Woodcock, 2001). These standardized measures are meant to provide “...greater accuracy and validity when making comparisons among and between an individual’s obtained scores” (Mather et al., 2001, p. 3).

Many of these measures are used when students have received on-going intense interventions and continue to underachieve. In these cases, a trained person may be recruited to conduct one of these standardized tests. Lipson and Wixson (2003) recommended using

formalized assessments carefully, "...with a great deal of caution and ... used primarily as general estimates of various aspects of reading and writing, to be followed up by more in-depth, instructionally valid, informed measures..." (p. 430). In addition, standardized measures can be expensive to administer school-wide due to the cost of protocols, the expertise of those administering the tools, and the time to implement and score the assessment.

The limitations of standardized tests were realized early on, and changes began in the 1970s and 1980s when mastery learning was an educational focus (Leslie & Caldwell, 2009). The primary concern of educators at that time was to distinguish the subskills necessary for efficient and effective reading, and "the theory was that if they could divide the construct of reading comprehension, for example, into its discrete skills, then teaching those skills would result in improvement of comprehension" (Leslie & Caldwell, 2009, p. 405). Leslie and Caldwell (2009) recognized that research began to change how professionals taught and assessed reading comprehension, and it became apparent that "...comprehension was influenced by the knowledge base of the reader and the structure of text as well as by students' understanding of reading strategies..." (p. 406), making it apparent that the construct of reading was not unitary. Teachers have a wealth of knowledge regarding their students, and Lipson and Wixson (2003) cautioned that relying too heavily on formal assessments "...often lead teachers to believe that assessment and evaluation are someone else's job" and, "...may also cause teachers to discount or become inattentive to the high-quality information they themselves have" (p. 265). Assessment is meant to have a purpose greater than comparing a student to their peers "it should be designed to increase the goodness of the fit between each child and the materials and methods of instruction" (Lipson & Wixson, 2003, p. 265).

Although informal reading assessments "...are often accused of being subjective,

biased and unreliable” (Leslie & Caldwell, 2009, p. 409), Johns (2012) found they generally help “...teachers gain insights into students’ reading behavior” (p. 7). Teachers can use the results from informal assessments to determine independent and instructional levels of reading ability, to provide valuable feedback regarding weaknesses, to adapt instruction, and plan new learning tasks (Johns, 2012; Leslie & Caldwell, 2009). The reality is, “informal assessments are used by many classroom teachers to make adjustments in their instruction” (Walker, 2008, p. 135), and as Leslie and Caldwell (2009) pointed out, “teachers rely on a variety of assessments” (p. 410).

Informal assessments may include informal reading inventories and rubrics; or, process- oriented assessments such as miscue analysis, think-aloud analysis, or running records (Walker, 2008). It is important to remember that assessments of any kind must have a purpose; and specifically, informal assessments are meant to: (1) evaluate reading behaviour, (2) monitor growth, (3) contribute to other assessment information, and (4) gather new information that was not available from other assessments (Johns, 1982).

Many reading behaviours are best monitored in an observational, informal way by trained teachers; the information from these observations are valuable when planning interventions (Cunningham, 1982). Teachers are often provided professional development and training to utilize informal, curriculum-based assessment measure; therefore, these types of assessments are prevalent in educational settings. It is important not to underestimate the value of informal assessments; just as Johns (1982) established “...that informal tests represent one part of a balanced assessment program...teachers need to remember that informal assessment techniques are a legitimate means to gain insights into the teaching of reading” (p. 9). To assist with intervention plans, information can be collected using informal

assessments. As Snow et al. (1998) suggested, these allowed educators to compare “... less skilled readers on their comprehension (meanings of words, basic meaning of text, making inferences from text) and on the accuracy and speed of their identification of strings of letters as words (decoding familiar, unfamiliar, and pseudo-words)” (p. 60). Dougherty Stahl (2009) summarized the utility of assessments in the educational system well in the following statement:

If we use assessment as a teaching and learning tool, we can streamline instruction and do a better job of meeting individual student needs. Assessments need to be chosen systematically and deliberately, not added on to the existing assessment program as happens in many school districts. Effective assessment needs to be supported by sustained professional development. But primarily it needs to be a theoretically-driven system that is situated in instructional practice. (p. 444)

Catching students early is important; Shaywitz (2003) stated, “advantage accumulates and leads to still further advantage; conversely, initial disadvantage is accentuated over time” (p. 34). Therefore, it is crucial that children are identified early and an intervention plan is put in place quickly so students are given the opportunity to attempt to reduce the effects of this disadvantage (Cipielewski & Stanovich, 1992; Cunningham & Stanovich, 1997; Sparks et al., 2013). Effective reading programs should be put in place immediately; and frequent monitoring of progress in the five foundations of reading can assist with this process (Foorman & Torgesen, 2001; NRP, 2006; Shaywitz, 2003; Snow et al., 1998; Torgesen, 2000). The importance of literacy to the overall well-being of the learner has led to the development of a plethora of informal assessment practices that target the five foundations of reading which will be discussed in detail next.

Foundations of Reading

Evolutionarily speaking, the brain was not made to read (Blomert and Crépe, 2012). To improve reading outcomes for students, teachers should implement practices that have proven successful in the past. Following are several general characteristics of environments conducive to learning: (1) instruction which is organized around big ideas and concepts; (2) guessing of unknown words is discouraged; (3) explicitly taught reading strategies are reinforced; (4) a brisk pace is maintained to keep students' attention; (5) opportunities are provided to review continually so students have a chance to assimilate new knowledge; (6) the teacher minimizes talk; (7) corrective feedback is given in a timely fashion; and (8) teachers assist students as they make links between new and stored knowledge (Blomert and Crépe, 2012; Bursack & Blanks, 2010; Coyne et al., 2001; Gersten et al., 2001). Although many of these characteristics may be evident in classrooms, other potential barriers to learning may arise (i.e., understanding the alphabetic principle and acquiring comprehension skills) (Snow et al., 1998).

To overcome these barriers effective practices should be put in place. The most effective reading programs (i.e., those that have reduced the need for remediation) ensure adequate instruction in five foundational areas: phonemic awareness, phonics, fluency, vocabulary, and comprehension (NRP, 2006; Foorman & Torgesen, 2001; Snow et al., 1998; Torgesen, 2000). Understanding the important link each of these areas has to the development of reading proficiency can assist educators as they attempt to plan for non-responding students (Hudson, Torgesen, Lane, & Turner, 2012).

Phonemic awareness involves the ability to distinguish, blend, segment and manipulate

the smallest parts that make up oral language or phonemes (Melby-Lervåg, Lyster, & Hulme, 2012; NICHD, 2000). The English language is an “alphabetic script,” meaning we are able to map letters to speech sounds, or graphemes to phonemes, and when we use this information about sounds we are using phonological skills (Blomert & Crépe, 2012; Duff & Clark, 2011). Phonemic awareness instruction is instrumental to an effective reading program, and many students require additional support and time to acquire these skills (NICHD, 2000). Melby-Lervåg et al. (2012) carried out a meta-analytic review that focused on phonological skills and the role they play in learning to read; their findings demonstrated the importance of phonological awareness as a predictor of reading development. This supported Griffiths and Stuart’s (2011) earlier findings that, “...‘at-risk’ poor readers benefit from explicit training in phonological awareness skills (specifically phonemic awareness) as part of their reading intervention program” (p. 99). Although important, phonemic awareness does not guarantee successful reading acquisition. Pokorni, Worthington and Jamison (2004) found, “...even in large doses interventions that are focused narrowly on phonemic awareness do not automatically improve reading skills” (p. 156). This reiterates that, “...phonological awareness should be seen as part of a broader program of overall language development” (Gunning, 2000, p. 3). Griffiths and Stuart (2011) found that many students that have difficulties in the area of reading struggle with, “...a word-level reading difficulty, which requires explicit instruction in phoneme awareness and phonemic decoding skills” (p. 98).

Snow et al. (1998) captured the importance of phonemic awareness when they stated, “in short, the goal of phonological training is limited to facilitating the acquisition of word-decoding abilities, which are necessary but not sufficient for the development of skilled comprehension” (p. 251). Phonological awareness instruction, although necessary for skillful

reading, is not meant to be a standalone intervention; rather, it is meant to be “...the first of many aggressive steps that can be taken in an ongoing effort to intensify all facets of reading instruction for school children who need it” (Snow et al., 1998, p. 251). Stahl, Duffy-Hester, and Dougherty Stahl (1998) discussed the importance of the alphabetic principle, or “...the notion that letters in words stand for specific sounds” (p. 128), and how closely it depends on phonological awareness development. An investigation should be done for students who are not learning to read in an effort to analyze their understanding of phonological awareness and the alphabetic principle (Snow et al., 1998).

The assessment of phonemic awareness skills can be conducted both formally and informally in educational settings, and “teacher-developed tests can provide excellent data on student progress and where instruction needs to be rethought and revised...” (McCardle et al., 2008, p. 225). When assessing phonemic awareness, a variety of tasks should be investigated. Snow et al. (1998) highlighted these activities which included the need for students to “...isolate or segment one or more phonemes of a spoken word, or to manipulate the phonemes within a word (e.g., adding, subtracting, or rearranging phonemes of one word to make a different word)” (p. 51). They pointed out that phonemic awareness involved more than simply rhyming or understanding alliteration and that care was required when assessing phonemic awareness skills (Snow et al., 1998). When assessing these skills “...it is always prudent to assess also the accuracy of the child’s perception of the stimuli (e.g., by having the child repeat items aloud before performing the desired manipulation of the sounds)” (Snow et al., 1998, p. 55).

Although phonemic awareness has a strong, almost reciprocal, connection to phonics, it is important to distinguish phonics from phonological awareness (Stahl et al., 1998).

Essentially, as Snow et al. (1998) outlined, “phonics is the term that has long been used among educators to refer to instruction in how the sounds of speech are represented by letters and spellings...” (p. 55). In order to decode words that are unknown, the reader should know that letters represent sounds, and that the English language has many word families (segments) that are within unrecognizable words (Ehri, 2006; NICHHD, 2000).

A primary goal of phonics instruction is to focus on the association of grapheme to phoneme (letter to sound) relationships, and the ability to distinguish and manipulate sounds; thereby, facilitating the learning of phonics and enabling students to apply this learning as they read text (Ehri, 2006; Gunning, 2000; NICHHD, 2000; Stahl et al., 1998). To achieve this goal, it is necessary to directly teach the alphabetic system, particularly for non-responding readers (NICHHD, 2000). McCardle et al. (2008) stated that “both reading and spelling rely on the same underlying knowledge: *alphabeticity*, or the relationship between sounds and letters” (p. 118). In addition to being systematic, instruction in the area of phonics must also be direct; beginning with the simplest sound-symbol pairings before moving on to more complex combinations (NICHHD, 2000; Shaywitz, 2003). Walker (2008) discussed how “one of the best ways to evaluate phonic knowledge is to analyze children’s spelling....thus, spelling is closely linked to phonic knowledge” (p. 87). In addition, Lipson and Wixson (2003) stated that “both informal and formal tests of phonic and structural analysis typically contain lists of nonsense words that embody one or more of the sound-symbol patterns” (p. 353). They go on to explain that “the advantage of nonsense words is that it is possible to evaluate students’ knowledge and application of word analysis strategies ...” (p. 353).

Another important foundational skill emergent readers require is fluency. This important skill is tied to comprehension and is summarized as reading quickly and accurately

with expression and understanding; rarely needing to stop to sound out words (McCardle et al., 2008; NICHD, 2000; Shaywitz, 2003). Students that are not able to read fluently, often have poor grade-level sight word banks making it difficult to make meaning of the text that they read (Denton et al., 2003; NICHD, 2000). Torgesen (2011) stated that, "... reading fluency for text is most directly dependent on the proportion of the words in text that can be identified at a single glance" (p. 197). McCardle et al. (2008) discussed the importance of ensuring students have sight word banks consisting of "...words that are common or high-use words, for which students have concepts but which may be difficult to decode even when students have mastered letter- sound correspondences" (p. 86).

An ability to recognize these words quickly, at a glance, frees up cognitive resources for comprehension, supporting the importance of including fluency instruction and sight word practice in an intervention plan (McCardle et al., 2008). To ignore this component of reading for the most disadvantaged student would be detrimental, as Torgesen (2011) confirmed, "for children with reading disabilities who have limited sight word vocabularies and limited proficiency in decoding novel words, it seems that the first target of intervention should be to increase the accuracy of their individual word reading skills" (p. 199). Again this skill is not one to be taught in isolation because of the dependence of it on the other foundations of reading, but it does require practice in order to become automatic (Snow et al., 1998); and, as Hudson et al. (2012) indicated, automaticity largely influences a student's ability to read fluently.

Good readers, or those that scored well on reading tests (i.e., in the upper 10% of their peer group) read a minimum of 20 minutes per day outside of school hours; in comparison, poor readers (i.e., in the lowest 10% of their peer group) read for less than one minute per day

(Shaywitz, 2003). Considering this, the proficient reader could read as many words in two days as a deficient reader would read in an entire school year (Torgesen, 2001). Undoubtedly, poor readers struggle with fluency, and experience limitations comprehending what they read (Denton et al., 2013). The importance of practice cannot be understated, and brain imaging technology has confirmed that practice and skill mastery are related, with practice improving reading accuracy (Shaywitz, 2003). Fluency measures usually include measures of oral reading rate, which is often determined by "...the *one-minute read*, in which students' oral reading accuracy is evaluated during one minute of reading. Students read unfamiliar text, and the number of words read correctly per minute is computed" (Lipson & Wixson, 2003, p. 346). Once this rate is established, the *Hasbrouck and Tindal Table* (Hasbrouck & Tindal, 2006) can assist with determining if a student is performing at expected levels for their age. In addition, by listening to students read orally, examination of their language use can be completed; this is often referred to as miscue analysis (Lipson & Wixson, 2003).

Efficient readers are able to read words faster, therefore they have more attentional energy left for comprehending the message within the text, which is a primary goal of reading (Stanovich, 1980). Lipson and Wixson (2003) discussed how "...one attribute of skilled reading is *automaticity* in word recognition. Good readers are able to recognize large numbers of words rapidly" (p. 350). This ability is often assessed using high-frequency sight word lists such as the *Dolch Sight Word Lists* (Dolch, 1951). Having a basic sight word bank is important for beginning readers, and Lipson and Wixson (2003) stressed that "assessment of sight words is essential, since students will find fluent reading difficult if they do not master these words" (p. 351). These lists can be administered at a rate of one card per second, using flash cards as the teacher marks those that are immediately and accurately recognized (Lipson

& Wixson, 2003).

Quick and automatic word identification, although important, does not necessarily translate into understanding of meaning; but, the ability to identify printed words is an essential skill that complements an individual's ability to comprehend text (Snow et al., 1998). Snow et al. (1998) confirmed that the ability to understand the meaning of words is important when developing an individual's vocabulary. One specific phonics-based instructional approach used in larger reading programs is a spelling-based approach called word study (Stahl et al., 1998). In *Words Their Way : Word Study for Phonics, Vocabulary, and Spelling Instruction*, authors Bear, Invernizzi, Templeton, and Johnston (2008) have students use word sorting and categorizing to better understand orthographic features of the English written language. Approaches that focus on spelling and vocabulary have the potential to help educators go one step further; focusing on the discrete aspects of words and showing students "...how to look at words so they can construct an ever-deepening understanding of how spelling works to represent sound and meaning" (Bear et al., 2008, p. 3).

Vocabulary development is closely tied to the ability to comprehend what has been read; therefore, it is important that it be addressed (NICHD, 2000). The study of vocabulary, as Bear et al. (2008) outlined, helps students learn to dissect words while finding common patterns that consistently arise in the English written language. These programs also assist students as they learn to spell, recognize, and understand the meanings of words (Bear et al., 2008). By providing repeated, direct instruction in the area of vocabulary, particularly words that will be encountered in rich contexts tied to the curriculum, students can actively participate in learning new vocabulary (NICHD, 2000).

Research supports the importance of knowing how pronunciations correspond to

various English spelling patterns, and this knowledge is often in the skilled readers' repertoire (Snow et al., 1998). This knowledge facilitates flexibility with word meanings, and sensitivity to changes of word forms or morphology (i.e., root words, suffixes, prefixes) (McCardle et al., 2008).

Another benefit of explicitly teaching students about the intricacies of words is that it helps them understand relationships among words, leading to a better understanding, "for example, "dislike" is related to "like," and "undo" is related to "do"" (Snow et al., 1998, p. 73). Lipson and Wixson (2003) outlined that "the recent development of various inventories in recent years provides teachers with excellent new tools to evaluate and interpret students' spelling and phonics knowledge" (p. 359). They added that these inventories, such as those found in *Words Their Way* (Bear et al., 2008), "...provide examples of alternative spellings and detailed error analysis guides to aid in interpreting students' spelling productions" (p. 359).

A firm grasp of phonemic awareness, phonetic decoding ability, sight word recognition, understanding the meanings of words and various spelling patterns, and the ability to read fluently are all useful tools for emerging readers (Foorman & Torgesen, 2001; NRP, 2006; Shaywitz, 2003; Snow et al., 1998; Torgesen, 2000). These skills assist the reader when they attempt to comprehend what they have read, and as highlighted by McCardle et al. (2008) "the importance of reading comprehension cannot be downplayed – it is the very essence of reading, its ultimate goal" (p. 140). McNamara (2007) defined reading comprehension as, "...the ability to go beyond the words, to understand the ideas and the relationships between ideas conveyed in a text" (p. xi). In a broader sense, reading comprehension involves complex thinking processes, improves academic outcomes, and enhances lifelong learning (NICHD, 2000).

Instruction in reading comprehension requires appropriate resources for educators so they feel prepared and sufficiently skilled to teach and model a variety of reading comprehension strategies (NICHD, 2000). Many reading strategies contribute to effectively comprehending what was read so it should be taught explicitly; these strategies include: making connections, summarizing, making inferences and predictions, visualizing, questioning monitoring understanding, and drawing conclusions (Anderson, Wang, & Gaffney, 2006; Cunningham, 1982; Hansell, 1982; Rasinski & Padak, 2004; Walker, 2008). Teaching about, and modeling these metacognitive strategies "...can enhance student comprehension of text, and can make students attend to specific aspects of text, recall content better, and monitor their own cognitive processes in reading" (McCardle et al., 2008, p. 153). Stanovich (1980) found that, "good readers appear to have superior strategies for comprehending and remembering large units of text" (p. 64).

Assessments of reading comprehension have attempted to "...evaluate whether students have understood what they have just read and to reveal whether they are developing the tools needed to understand other texts" (p. 279). Lipson and Wixson (2003) summarized the assessment of reading comprehension as follows:

In the area of comprehension assessment we suggested techniques for enhancing the information that can be gathered using traditional techniques like questioning and retelling. In addition, we described a verbal report, or think-aloud, procedure for assessing students' comprehension abilities. (p. 310)

In addition, in order for the results to be applicable to classroom-based instruction, the informal assessments should be closely tied to the day-to-day instruction within the class (Lipson & Wixson, 2003). Informal reading inventories are often used "...to create assessment conditions

that are as trustworthy as possible while still retaining an informal assessment environment” (Lipson & Wixson, 2003, p. 312).

These five foundations of reading are meant to be masterfully taught in conjunction within connected text. The most effective reading instruction programs and interventions target these foundations because they work together to help students become effective readers. In particular, tier three students require frequent monitoring to ensure they are progressing in these areas, as Fuchs and Fuchs (2007) stated, “a key component of a three-tiered approach to intervention is assessment...” (p. 29). The following section discusses the RTI model and how it addresses the needs of struggling learners.

Response to Intervention

The National Association of School Psychologists (NASP, 2009) found that, “recent research suggests that an effective education for students can be accomplished with alternative multi-tiered systems that incorporate evidence-based academic curricula and supplemental targeted and intensive interventions” (p. 4). In general, a tiered system is meant to have a school-wide base that is dependent on strong, effective, scientifically-based instruction with the intention of preventing reading failure; but, providing small group or one-on-one programming if deemed necessary (Al Otaiba et al., 2006; NASP, 2009; Torgesen, 2007). Importance is placed on frequent student progress monitoring through the collection and evaluation of various data; this ensures students are making adequate progress and leads to the construction of an appropriate, needs-based, instructional plan (Johnson & Boyd, 2012; NASP, 2009; Torgesen, 2007).

In this multi-tiered approach, the intensity of the interventions is meant to increase based on student need, and should take into account student diversity (i.e., socioeconomic

status, cultural background and race) while directly linking to each individual's educational needs (NASP, 2006; NASP, 2009). An expectation within this model is that the number of students that will continue to require resource room support in the future will decrease, while attempting to catch-up those students that are behind their same-aged peers (Bursack & Blanks, 2010; NASP, 2006). Collaboration of many educational stakeholders (i.e.; parents, administrators, teachers, resource teachers, and other professional staff) facilitates decision-making regarding use of collected data and can guide early interventions (NASP, 2006). Although some multi-tiered systems have anywhere from two to five tiers, the majority focus on three tiers or levels (NASP, 2009). Tier one involves school-wide screening and instruction, tier two is more targeted and focuses on progress monitoring, and tier three is intensive in nature and requires continuous progress monitoring (NASP, 2009).

The assumption of tier one, sometimes referred to as primary prevention, instruction is that all students receive delivery of core curriculum through evidence-based instruction – which would involve the use of frequent (i.e. three times per year), school-wide screenings to monitor student growth; thereby allowing for identification of those not progressing and requiring further support (NASP, 2009; Snow et al., 1998). Tier one instruction must be responsive to identifying the students that are not acquiring the skills and this must take place early (Griffiths & Stuart, 2013). During these formative years, curriculum-based measurement screeners are often used to distinguish those students that have not acquired core skills expected for their age (NASP, 2009). The expectation is that 80-85% of students will be demonstrating success at this level (NASP, 2009).

Tier two intervention programs, also called secondary prevention, are meant to target those students who have been receiving adequate instruction but are not progressing at

expected levels, as indicated by the screening tools used at tier one (NASP, 2009; Snow et al., 1998). Interventions at this level supplement tier one programs, they should be of high quality and target specific strategies and interventions to meet the specific student needs (Griffiths & Stuart, 2013; NASP, 2009). This instruction is delivered in a small group, preferably no more than three to five students per teacher, it is administered up to 20 weeks, for a minimum of three times per week, and progress is monitored on a monthly basis to ensure that the intervention is effective, making changes as necessary (Griffiths & Stuart, 2013; NASP, 2009). Less than 20% of the population should require this level of support, and 10-15% of these students should be successful after the intervention (NASP, 2009). Tier two interventions are essential for struggling students, “the extra effort is focused on children at higher risk of developing reading difficulties but before any serious, long-term deficit has emerged” (Snow et al., 1998, p. 16).

If a student continues to struggle after attending effective tier two programming they would then be candidates for tier three interventions, sometimes called tertiary prevention, with a focus on individualization, frequency and intensity (Griffiths & Stuart, 2013; Snow et al., 1998). Only a small percentage of students, 5% or less, should require this individualized, highly intense level of intervention which requires almost weekly monitoring to ensure progress toward the established goals (NASP, 2009). Snow et al. (1998) pointed out that, “programs, strategies, and interventions at this level have an explicit remedial or rehabilitative focus” (p. 16). This level of support is expensive because it requires more time and an even lower student-to-teacher ratio to maintain the intensity; therefore, it is expected to accelerate reading outcomes for the student (Griffiths & Stuart, 2013). If response at this level is not evident it may indicate that a comprehensive psycho-educational report is required to establish

cognitive strengths and weaknesses that may be inhibiting the acquisition of reading skills (NASP, 2009).

In an RTI framework, evidence-based instruction is the backbone of each of the three tiers, but instruction at each tier increases with the need of the learner, allowing educators to tailor their instruction based on the needs of each individual (McCardle et al., 2008). At its most primary level it involves sound practice and may also focus on school or division initiatives targeting broader goals; going up the tiers (i.e., secondary and tertiary) involves more individualized involvement of resource staff and requires more intense and explicit instruction in smaller groups or one-on-one involvement (Snow et al., 1998). McCardle et al. (2008) outlined the importance of including both general and special education teachers, confirming that the framework is dependent on collaboration. However, even when educators work together to provide exceptional instruction while implementing effective tiered responses, a small percentage of the student body may fail to make reading gains that match the effort they put forth (Snow et al., 1998). What follows is a summary of several reading intervention studies that have been conducted with students that have been considered non-responders.

Research of Intense Reading Interventions

Children and teachers differ in regards to learning and teaching styles; therefore, there will never be just one best program or method to teach reading that works for all children (Allington, 2012). Even so, it is important that practitioners remember “teaching and learning are complex phenomena that can be enhanced or impeded by many factors” (Snow et al., 1998, p. 36). As a result, teachers must be prepared to adapt what they are doing to meet the needs of their students, but it is safe to say children require “...simultaneous access to some

knowledge of letter-sound relationships, some sight vocabulary, and some comprehension strategies” (Snow et al., 1998, p. 84). Planning interventions for those students that have not responded to basic classroom instruction (tier one) or some resource intervention (tier two) then require more intense interventions (tier three), “however, there is little evidence that children experiencing difficulties learning to read, even those with identifiable learning disabilities, need radically different sorts of supports than children at low risk, although they may need much more intensive support” (Snow et al., 1998, p. 32).

As discussed earlier, effective literacy programs should incorporate instructional components that focus on: the alphabetic principle, phonemic awareness, phonetic decoding, rapid word reading, vocabulary development, fluency and comprehension (Foorman & Torgesen, 2001; NRP, 2006; Shaywitz, 2003; Snow et al., 1998; Torgesen, 2000). Shaywitz (2003) reiterated the importance of directly and systematically incorporating these instructional components when establishing intervention plans, and added the importance of providing students sufficient time to practice these skills. Many research studies have analyzed these components in relation to intense, tier three intervention plans in an effort to determine the effectiveness of improving outcomes for struggling readers. Studies have investigated the use of explicit instruction, differential training effects for various programs, the effects of manipulating the amount of time in an intervention, characteristics of non-responding students and implications for struggling EAL readers (Denton et al., 2006; Denton et al., 2013; Gunn, Biglan, Smolkowskil, & Ary, 2000; Katzir, Goldberg, Arey, Donnelley, and Wolf, 2013; Pullen and Lane, 2014; Ring et al., 2012; Velluntino et al., 1996).

A significant response to intensive intervention for 27 participants (i.e., Grade One (n=5), Grade Two (n=11), and Grade Three (n=11)) with on-going difficulties in reading was

noted in Denton et al.'s (2006) study. This study used a multiple-baseline design with analyses focusing on within-group pre- and post- assessment comparisons of difference. For the students that were referred by teachers, a screener was used to gain information regarding several reading skills; then, based on these results the researchers determined if further standardized testing using the WJ-III ACH (Woodcock, McGrew, & Mather, 2001) was required. The results from basic reading subtests on this assessment had to be at, or below, the 30th percentile in order for students to meet the criteria for inclusion in the intervention program. Explicit instruction in the following reading skills: comprehension, decoding, fluency and spelling, took place over 16 consecutive weeks. For the first eight weeks, decoding instruction using the commercial program *Phono-Graphix* (McGuiness, McGuiness, & McGuiness, 1996) was delivered for two hours each day, five days per week (approximately 80 hours of instruction). This program targeted explicit instruction in blending, segmenting, and manipulating sounds using 140 different *sound pictures*.

In this program, students first learned basic skills (i.e., understanding that pictures of sounds represent letters), then they moved to more advanced skills (i.e., understanding how to spell and read multi-syllabic words) (Denton et al., 2006). Over the remaining eight weeks, fluency instruction using a text-level approach, the *Read Naturally* program (Ihnot, Mastoff, Gavin, & Hendrickson, 2001) was implemented for one hour per day, five days per week (approximately 40 hours total instruction time). This program focused on having students read with a model. Children would then repeat read their selections until a set goal was reached. Pre- and post-assessments were completed after each of the component parts of the intervention. Measures included subtests from the following: TOWRE (Torgesen, Wagner, & Rashotte, 1999); GORT-4 (Wiederholt & Bryant, 2002); and, the WJ-III ACH (Woodcock,

McGrew, & Mather, 2001). Results from this investigation showed significant improvements in comprehension, decoding and fluency skills. Those that responded the most, were those that had previous interventions in both tiers one and two prior to this tier three intervention.

Another study that looked at a tier three intervention with a specific focus on explicit instruction in the area of reading fluency was conducted by Ring et al. (2012). They conducted a cluster-randomized clinical trial that compared the efficacy of two programs (i.e., *Rite Flight*; Avrit et al., 2006; and *Read Naturally*; Innot et al., 2001) in the area of reading fluency (i.e., automaticity, accuracy and rate). Participants consisted of 86 grades two to five students who fell well below expected levels on measures of oral reading rate using the *Hasbrouck and Tindal Table* (Hasbrouck & Tindal, 2006). The main purpose of this study was to investigate the differential training effects for text-level (*Read Naturally*; Innot et al., 2001) versus word-level (*Rite Flight*; Avrit et al., 2006) reading fluency.

Students received the treatment for 30 minute sessions, for an average of 44 classes, over a three month period. Word-level instruction consisted of 15 minutes of direct instruction in reading fluency and 15 minutes of instruction in reading comprehension; whereas the text-level instruction focused primarily on re-reading of text until a student reached a set goal.

Outcome

measures included the following: reading fluency of continuous text using the GORT-4 (Wiederholt & Bryant, 2002); isolated word efficiency using the TOWRE (Torgesen, Wagner, & Rashotte, 1999); and, basic word identification, word attack and reading comprehension from the WRMT-R/NU (Woodcock, 1987). A repeated measures multivariate (MANOVA) approach to analysis was used with all standardized reading data and results indicated that both treatment groups made reliable gains of oral reading fluency measures, and that younger

children, specifically those prior to the end of grade two, made significantly greater gains on reading measures than older students. Ring et al. (2012) felt that additional research was required to find the optimal combination of assessment and treatment to meet the needs of students.

Velluntino et al. (1996) conducted a longitudinal study which focused on manipulating intervention times allotted for students requiring intense intervention in reading. The original target group was narrowed by having teachers use a rating scale to indicate those they felt were not progressing in reading. This score, in addition to further testing using the WRMT-R (Woodcock, 1987), confirmed underachievement. The sample consisted of 118 students who were then compared to a group of 65 average readers. Results for the poor readers who received one-on-one tutoring for 30 minutes per day over a minimum of 15 weeks (approximately 70-80 sessions) indicated they made significant gains in standardized reading measures compared to those students that received school-based support as per normal. Data from this study suggested that phonemic awareness, at least for beginning readers, appeared to be more important in relation to learning to read than general intelligence scores. This suggested that as long as individuals were within, or approaching, average intelligence they would be able to learn to read effortlessly assuming phonemic awareness was well established. Velluntino et al. (1996) reaffirmed the importance of this skill for deficit readers with the following statement,

Our results suggest that, although reading difficulties in most children from middle- to upper middle-class backgrounds are quite likely caused by experiential and instructional deficits, there are substantial numbers of these children whose reading difficulties may be caused by basic phonological coding deficits that may well be of

constitutional origin.

The data in effect, validate the highly convergent findings from previous research implicating phonological coding deficits as a probable cause of reading disability in such children. (p. 633)

In this instance, varying the intensity and duration of tier three interventions had a positive effect for struggling readers. Questions remained regarding what age, how intense and for what duration intervention programs were required to make statistically significant gains for poor readers.

Gunn et al. (2000) conducted a randomized control trial with 256 students between kindergarten and grade three to investigate the effects that English as an additional language had on a students' ability to make reading gains. These students were below their grade-level on the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS) early screening tool and they also scored high on an aggressive behaviour scale filled out by their teachers (Good, Kaminski, Laimon, & Johnson, 1992). Of this sample group, 158 students were Hispanic and 98 were not Hispanic. Students were randomly assigned to a treatment group that received supplementary phonological awareness and decoding instruction from trained instructional assistants, or to a control group that provided no additional instruction. The intervention took place over a 56 week period. Those in the treatment group received 50 minutes each day of additional instruction in a small group of three to five students. The purpose of this study was to report the effects of additional instruction in specific reading skills (i.e., phonological awareness and basic decoding skills); to investigate how this instruction contributed to reading comprehension, vocabulary, and oral reading fluency gains; and, to determine if supplementary instruction was beneficial for Spanish-speaking children (Gunn et al., 2000).

Reading skills were assessed three times (e.g., pre-intervention in the fall, follow up in the same school year in the spring, and again in the spring of the following year). These measures included oral reading fluency scores for one-minute timed readings, in addition to the Letter-Word Identification and Word Attack subtests from WJ-R ACH (Woodcock & Johnson, 1989) for all three assessment periods. For the final assessment period the Passage Comprehension and Reading Vocabulary subtests were also administered. Results of this study showed significant effects for those students that took part in the intervention group, particularly in measures of vocabulary, decoding and reading comprehension measures; and to a lesser extent, reading fluency. Gunn et al. (2000) found "... that duration of instruction may be a critical factor," going on to explain that, "this suggests that longer term interventions may be necessary for preventing reading failure and helping lower performing students catch up to their typically achieving peers" (p. 100).

This study had implications for individuals who do not speak English as their first language. For this group of children, Gunn et al. (2000) determined that their results indicated "...Hispanic children who received supplemental instruction in reading English benefited as much as did non-Hispanic children" (p. 101). In addition, it was documented that "students who spoke only Spanish at the outset and who received the supplemental instruction performed significantly better on oral reading fluency than did those who did not receive supplemental instruction..." (Gunn et al., 2000, p. 101).

In another study, Denton et al. (2013) conducted a randomized controlled trial to determine the effectiveness of a tier three intervention that was individualized and more intense than regular instruction. Participants included 72 grade two students that had been deemed inadequate responders based on exemplary instruction in both tiers one and two during

grade one. Denton et al.'s (2013) purpose of this study was two-fold: (1) they attempted "...to evaluate the efficacy of an individualized, intensive reading intervention for studentswho had demonstrated insufficient response to a highly standardized intervention provided the previous year in first grade" (p. 635); and, (2) they investigated specific cognitive characteristics of those students that continued to demonstrate an inadequate response. One group of participants (n=47) were randomly assigned to a control group, and the other participants (n=25) received instruction that was typical for their school. The students that received the intervention were provided 45 minutes of daily instruction, in small-groups of two to three students, over a 24 to 26 week period. This intervention was a modification of the *Responsive Reading Instruction* program (RRI; Denton & Hocker, 2006), in addition to components of *Read Naturally* (Ihnot et al., 2001) for those students who needed reading fluency practice. The RRI (Denton & Hocker, 2006) program is a supplement to reading instruction that focused on reading fluency, word study, reading comprehension and a written response (Denton et al., 2013). Teachers used diagnostic assessments to pinpoint individual strengths and weaknesses, and then they individualized instruction appropriately. Results of this study showed that students in the intervention group "...made significantly better growth than those who received typical school instruction on measures of word identification, phonemic decoding, and word reading fluency and on a measure of sentence- and paragraph-level reading comprehension" (Denton et al., 2013, p. 633). At the conclusion of the article questions remained, suggesting that "successful remediation may require longer term intervention or a different approach..." and moving forward, researchers "...should continue to examine the effects of intensive interventions for students who demonstrate inadequate progress in less intensive treatments" (Denton et al., 2013, p. 645).

In a recent study, Pullen and Lane (2014) carried out a comparison that investigated the effects of different instructional approaches to decoding practice for 98 students in grade one who were struggling to acquire beginning reading skills. The purpose of this study was to look at the effects of teaching the alphabetic principle to struggling new readers in a systematic and explicit way using manipulative materials (i.e., letter tiles) to practice the skills of blending and segmenting phonemes. Pullen and Lane (2014) randomly assigned participants to one of three groups: (1) a treatment group (n= 33) who practiced decoding skills using manipulative letters for an average of 22 minutes per session, over 30 sessions, while in a small-group of three students; (2) a comparison group (n=32) who was identical to the treatment group except they did not receive practice using manipulatives; and, (3) a control group (n=33) who received no additional treatment. Assessment measures included the *Peabody Picture Vocabulary Test* (PPVT; Dunn & Dunn, 1997) a measure of receptive vocabulary, informal phonological awareness, decoding and sight word reading measures, and two subtests from the *Woodcock Diagnostic Reading Battery* (WDRB; Woodcock, 1997). Pullen and Lane (2014) used a pretest and posttest design, and analyzed data using a series of ANCOVAs with the decoding, sight word reading, and phonological awareness, and an ANOVA for each of the subtests on the WDRB (Woodcock, 1997). Results from the analysis suggested, "...that the addition of decoding practice using manipulative letters improves early literacy skills for struggling readers" (Pullen & Lane, 2014, p. 13). In addition, they pointed out that "the incorporation of decoding practice with manipulative letters implemented in small groups in this study was validated as an effective strategy for developing word-reading skills for struggling first-grade students" (Pullen and Lane, 2014, p. 14).

Katzir et al. (2013) investigated the effects of a fluency-based reading intervention

(Retrieval, Automaticity, Vocabulary, Elaboration, Orthography (RAVE-O); Wolf, Miller, & Donnelly, 2000) with 80 participants from grades one to three. The purpose of this study was “...to extend the program RAVE- O to different settings and different populations in order to determine the components necessary for intervention success” (Katzir et al., 2013, p. 64), as well as to determine if the duration of time a student spent in the intervention resulted in greater reading gains. They used a longitudinal study over a “...2-intervention period: a 9-month, 44- hour after school intervention program, and a month long, 44-hour summer intervention program” (Katzir et al., 2013, p. 61). These two intervention periods were then delivered in six different combinations to determine the effect of time on specific reading skill gains using two TOWRE subtests (Test of Sight Word Efficiency and Test of Phonemic Awareness; Torgesen et al., 1999).

Group one (n=16) took part in the summer program and the afterschool program immediately in the fall. Group two (n=11) participated in the afterschool program followed directly by the summer program. Group three (n=7) completed the afterschool program, had no intervention over the summer, but took part in the afterschool program again in the fall. Group four (n=16) participated in the summer program, had no intervention over the school year, but took part in the summer program again the following year. Group five (n=15) served as a control group and received only one summer program. Group six (n=15), another control group, completed only one afterschool program. All groups “...showed gains after a single intervention...” but, Katzir et al. (2013) found that “... groups who received a 2-package intervention either increased or maintained performance after the second intervention, suggesting that an additional intervention is beneficial” (p. 61).

Based on the results of this study it would appear that “... any remediation program is

better than none” (Katzir et al., 2013, p. 71). The results of this study provide valuable information for educational systems attempting to maximize effectiveness while maintaining efficiency. This study demonstrated the need for additional research regarding the amount of time required to achieve significant gains, as well as the timing of these interventions. Katzir et al. (2013) stated, “...it appears that an intervention program that has less total hours, but is spread out over this study allows for the possibility of scaling-up interventions to allow more children access to fewer hours of reading training” (p. 71). They went on to suggest “...that the most effective intervention combination is a slow introduction to the skills needed to succeed, followed by an intense period to use the skills” (Katzir et al., 2013, p. 71).

These research studies confirm a need for programs that are explicit and intense. However, questions still remain regarding the optimal amount of time required to make significant gains before the benefits of an intervention program level off. Tier three intervention programs are far from perfect and due to the variability and diversity of learners that are not responding, research in this area needs to continue to be investigated.

Description of Intervention Program

Canadian schools, similar to those in the United States, are experiencing increased diversity (i.e., socioeconomic status, culture, mental health, learning difficulties and disabilities, etc.) of the student body and limited resources present economic and logistical challenges (Al Otaiba et al., 2014). In an attempt to address these concerns, one urban school division in the western prairies of Canada, developed a program to meet the needs of their struggling readers. This division placed an emphasis on students that were two or more years behind their grade-level peers.

The rationale for developing this program grew from the ideology that, “no single

method or single combination of methods can successfully teach all children to read. Instead, each child must be helped to develop the skills and understandings he or she needs to become a reader” (International Reading Association (IRA), 2000, p. 3). In line with the IRA (2000), the division also promoted the belief that, “because children learn differently, teachers must be familiar with a wide range of proven methods for helping children gain these skills” (p. 3). This led the division to launch a pilot project in September 2011 to address the needs of those not responding to typical tier one and two interventions. The initial pilot included only one public elementary school, but by January 2014 a total of 33 schools were implementing some form of this reading program. The intention of the program was to improve reading outcomes by lowering the student-to-teacher ratio, planning explicit and systematic instruction, and extending the amount of instructional time tier three students received. For these reasons, this program was, and continues to be expensive to operate. An investigation is warranted to determine if reading gains are being made by these students, and if the gains are significant (i.e., helping close the gap between their same-aged peers).

A description of the program they implemented follows. First, background information and a detailed description of the various components used to meet students’ needs is provided. Next, the program goals and intended outcomes are outlined, followed by a description of the assessment procedures that were established. A discussion regarding the strengths and weaknesses of this intervention program concludes this section.

Program Components

This program was developed to address the needs of elementary students. A junior program was developed for students in grades two through four and a senior program serviced the needs of students in grades five through eight. Although the two programs were

built on the same five foundational components of reading discussed earlier (phonemic awareness, phonics, vocabulary, comprehension, and fluency (NRP, 2006)) the approach for each group was slightly different. This investigation focused on children in grades two through four, therefore the junior program will be explained in depth.

The original intention of this program was to deliver 100 minutes of reading instruction, four days per week, for 16 consecutive weeks, at a ratio of four students to one trained adult (i.e., either a resource teacher, or if more than four students were included a resource teacher and a trained educational assistant). The junior program included time for independent reading, phonics instruction, reading centre time, teacher readings, and an exit pass which included homework. A detailed explanation of each of these components follows.

Independent Reading (15- 20 minutes per session). The first section of the class was spent having the students independently use their bag of individualized materials. This bag included four to five appropriately levelled readers and sight word cards (12 at one time) as determined using a Dolch sight word list (Dolch, 1951) pre-intervention assessment. During this time the teacher went to each student, one at a time, to listen to them read the words from their bag. The teacher continually documented progress of these activities, then based on the child's progress adjusted the level of readers and/or exchanged sight word cards when necessary. The students read in this fashion for approximately 15 minutes. After the teacher had spent time assessing the sight words with each student, a connected *Word of the Day* was clipped to the outside of the teacher's shirt, and was introduced to all four students. The meaning and spelling of this word was discussed, then for the remaining 85 minutes of class the word was referred to as often as possible. This *Word of the Day* became the student's exit pass, and they knew they would be expected to read and spell the word prior to leaving for the

day.

Phonics (15-20 minutes). There were four distinct phases used to deliver phonics instruction. First, *PhonicsQ* (Herzog, 2011) a commercially purchased resource was used to promote the use of visual anchors so students remembered various sounds of consonants and consonant combinations, as well as short and long vowels, and vowel digraphs. Each day the teacher introduced, to all four students, a new visual cue card. The second phase was a shared literacy experience using phonics poetry. The teacher used a poem that focused on the phonics concept that was the target during the four day weekly cycle. This weekly poem was written on large chart paper, read, and rehearsed as a reader's theatre activity while various phonics concepts were highlighted. The third part of this block of time was dedicated to another commercially purchased program, *Words Their Way* (Bear et. al., 2008). This program focused on the study of words and the use of spelling patterns and meanings (Bear et al., 2008). Bear et al. (2008) stated, "in a sense, word study teaches students how to look at words so they [students] can construct an ever-deepening understanding of how spelling works to represent sound and meaning" (p. 3). The program allowed teachers to quickly determine the spelling ability level (i.e., emergent, letter name, within word, syllables and affixes, or derivational) of the student and then choose the appropriate phonics feature to target. Using the assessment tool from this resource, teachers then individualized each student's work. For example, a student in the emergent phase may be given two cut out titles (Hh,Jj) and then be provided fifteen pictures of different objects that started with one of the target sounds /h/ or /j/ to sort under the appropriate header; whereas a student in the within word pattern stage may sort long, versus short, u words rather than pictures (Bear et al., 2008). The final component of the phonics section of programming also came from a commercially designed program titled

Systematic Sequential Phonics which had children working with and manipulating letter tiles or cutouts to construct and deconstruct words (i.e.; hat changes to cat which changes to act, and so on) (Cunningham, 2002). The lessons were chosen to coincide with the other components of phonics that were being targeted.

Reading Centres (35-40 minutes). During this section of time, students rotated every ten minutes between three independent centres and one teacher directed centre. These centres are described in detail below.

Raz-kids. This on-line subscription offered interactive books on the computer, levelled books (Learning A to Z, n.d.) that students could read based on their independent reading levels as determined by the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010). During this time students independently listened to audio of a book at their level while following along with the visuals on a computer. The student then independently read the book aloud (with the option to record it using a microphone and then email it to the teacher), or they could read the same book silently. Last, students answered five multiple-choice comprehension questions about what they had just read. Students earned points for every book they read and these were used to *buy* various furniture and creatures for their own interactive *Rocket Room*, which served as a great motivator for these young children.

Teacher timed oral reading. The teacher used folders which housed all materials the student required. These included the student's current Dolch words, a graph charting successful reading of the Dolch words, an appropriate levelled book (from Raz-Kids), a running record chart for the book, as well as a list of comprehension questions for that book or passage. The teacher, one-on-one with the student, went over the Dolch words ensuring the student understood the meaning of each word and could read each one. Next, the teacher had

the student make predictions about the book that would be read, the student then read the book as the teacher timed for one minute. At the end of the minute the teacher recorded the number of words read correctly and went over any errors made by the student. This was repeated two more times, if the student did not finish the book after these additional two minutes it was continued the next class. The comprehension questions were completed when the book was complete. Immediately after this the student would read their Dolch words one more time. The teacher would request that students rotate to their next centre when complete.

Whisper phones. Working from the same four or five levelled books contained within their reading bag or timed reading binder, each student took their chosen book and the whisper phone to a cozy corner established in the room. These areas were meant to be inviting and many included tent-like forts or bean bag chairs. The whisper phone allowed students to speak quietly into the device and hear their voice louder, so they could read to themselves without disturbing others.

Teacher's choice. During this centre the teacher chose from a variety of suggested literacy-based activities. These included *Earobics*, an individualized phonemic awareness computer program (Cognitive Concepts, 1999), various educational iPad apps, reading games, and other literacy-based activities. This centre was optional, and if teachers felt they could fill the 35 to 40 minutes with the other three centres they were not required to include these activities.

Teacher Read (25-30 minutes). During this centre the teacher chose an appropriate story to read that would allow for a focus on comprehension strategies and vocabulary development. The teacher chose two to three words from the cover of the book that would be highlighted throughout the lesson. The book and words were introduced by the teacher,

then before and during reading comprehension strategies were targeted. After reading the story a focus was placed on retelling the story, discussing important vocabulary words, and reviewing the comprehension strategies used.

Exit pass/homework. Before students could exit the room they were required to read and spell the target *Word of the Day*, then take home a reading bag which held the book they read with the teacher during the timed reading, as well as their Dolch sight words. The expectation was that the students read every night at home; however, if the teacher was concerned the reading would not get done at home an educational associate went to the student prior to the end of the day to ensure the homework was done before they left.

Goals and Intended Outcomes

This program was developed as a result of the increasing literacy needs of students in this school division. Research-based reading components (i.e., the five foundations) were used to develop this program, ensuring the intervention was intense and individualized for those students that had not responded to earlier tiers (one and two) of intervention. Students were referred to the resource teacher based on reading difficulties that the teacher considered pervasive. The main goal and intended outcome of this intervention program was to quickly remediate reading difficulties and to have students reading at, or near, their grade-level averages after only 16 weeks.

Implementation Guidelines

To ensure fidelity, teachers of these programs were required to have resource staff trained in delivering the program as outlined above. Four educational consultants worked with the resource teachers on an ongoing basis, spontaneously checking-in to ensure that each component was adhered to, and that data collection continued to drive individual programming

of each student. These consultants remained involved throughout the year, to ensure that resource teams running the program felt confident with delivering programming, collecting data and interpreting that data in a way that drove instruction.

Assessment and Progress Monitoring

Each student had their progress monitored using five tools. The Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010) was used to allow the teacher to determine the students reading level, taking into consideration reading accuracy, fluency and comprehension. Graded Dolch sight word lists (Dolch, 1951) were used to determine the number of words students were able to fluently read at their appropriate grade. A *Words Their Way* (Bear et al., 2008) spelling inventory was used to determine what spelling patterns and phonetic rules were known, and one of two phonemic awareness assessment tools were used to determine the students skill level with basic alphabetic principles. The Learning Disability Association of Alberta - Reading Readiness Screening Tool (LDAA, 2011) was used with those students reading at, or below a Fountas and Pinnell (Fountas & Pinnell, 2010) level G and the Quick Phonics Screener (Hasbrouck, 2011) was used with those assessed above a level G.

Entrance and exit data were collected for each student on each measure. In addition, two reporting periods, at week six and week thirteen, were required for Fountas and Pinnell (Fountas & Pinnell, 2010) testing; Dolch sight word progress; and, *Words Their Way* spelling inventories (Bear et al., 2008). Consistent with research, frequent progress monitoring was used to ensure that students were progressing at a reasonable rate and if they were not doing so adjustments were made (Johnson & Boyd, 2012; NASP, 2009; Torgesen, 2007).

One strength of this intervention program was that it was developed with the five foundations in mind (i.e., phonemic awareness, phonics, fluency, vocabulary, and

comprehension (NRP, 2006; Foorman & Torgesen, 2001; Snow et al., 1998; Torgesen, 2000)). In addition, developers relied on evidenced-based instructional methods in an attempt to make marked gains for these non-responding students. They attempted to establish low student-to-teacher ratios, provide ample engagement and practice of the essential skills of reading, and they used frequent progress monitoring to ensure that students were making gains. This division provided financial support for the program through professional development opportunities, purchasing of the necessary supplies, and employing four consultants who dedicated their time to establishing the programs.

Unfortunately, due to the high financial cost and time constraints, non-standardized measures pre- and post-intervention were administered, which has limited analysis of the collected secondary data. Again, due to the cost and time constraints, many schools have adjusted the number of sessions they are delivering, but the time and structure of each session and pre- and post-intervention measures being administered remained consistent. Additional information regarding the amount of time that is sufficient to make maximum gains has not been well-established.

Evidence-Based Instruction

In a perfect world, a researcher would strive to use only standardized measures that have been rigorously tested to ensure they result in consistent scores (reliable) and that they assess what they are purported to assess (validity); however, even with randomization, “the heterogeneity of participant characteristics poses a significant challenge to research designs based on establishing equivalent groups...” (Odom et al., 2005, p. 139-40).

The key difference between randomized field trials and other methods with respect to making causal claims is the extent to which the assumptions that underlie them are

testable. By this simple criterion, nonrandomized field trials are weaker in their ability to establish causation than randomized field trials, in large part because the role of other factors in influencing the outcome of interest is more difficult to gauge in nonrandomized studies. (CSPER, 2003, p. 110)

Gast and Ledford (2014) found that evidence-based practice, not necessarily a novel idea in and of itself, is the current trend in education, dictating that research drives educational practices. Educators and researchers are constantly seeking better ways to reach their goals; however, “there is a tension between the desire for locally usable knowledge on the one hand and scientifically sound, generalizable knowledge on the other” (Sandoval & Bell, 2004, p. 199). Odom et al. (2005) described special education settings as, “broader than general education” (p. 139) due to the diversity in special populations of students (i.e., specific learning disabilities, intellectual disabilities, English as an additional language, attentional and behavioural disorders, autism spectrum disorders and other diagnosed disabilities). They also stated that, “special education research, because of its complexity, may be the hardest-to-do-science” (Odom et al., 2005, p. 139).

Successful intervention plans are multi-dimensional, and are dependent on many environmental characteristics “... the student-teacher relationship, the teacher’s capability at maintaining order, the expectations of the students and their parents – that can neither be ignored or controlled” (Snow et al., 1998, p. 37). For this reason, educators may benefit from an approach that analyzes individual students’ performance, or difference scores, in comparison to themselves, providing valuable information about which students respond better to various interventions (Cipani, 2009). Leonard (1991) pointed out that “when randomization is not possible, one can employ quasi-experimental designs; however, quasi-experimental

designs are not as effective as experimental designs in controlling extraneous factors” (p. 294).

Snow et al. (1998) discussed how experimental studies are strong because they allow researchers to make casual inferences but they do recognize that these studies have limitations. Educational settings, educators, and students vary, “...the notion of a comparison between a treatment group and an untreated control is often a myth...Families who are assigned not to receive some intervention for their children ...often seek out alternatives for themselves ...” (Snow et al., 1998, p. 37). Ethically, many variables can’t be manipulated, and others, such as demographic information, are correlational; therefore, conclusions regarding them are often based on correlational evidence (Snow et al., 1998).

Unfortunately, non-experimental studies are often considered poor contributors to evidence-based practice, but this is untrue and “...although a correlational study cannot definitively prove a causal hypothesis, it may rule one out” (Snow et al., 1998, p. 39). Snow et al. (1998) also discussed how “... logistical difficulties in carrying out classroom and curriculum research often render impossible the logic of the true experiment” (p. 39). Thompson, Diamond, McWilliam, Snyder, and Snyder (2005) reported that quantitative studies result in evidence that is correlational in nature, and “correlational evidence can at least tentatively inform evidence- based practice when sophisticated causal modeling or exclusion methods are employed” (p. 181). Finally, it is important to remember, “although complex designs and state-of-the-art methods are sometimes necessary to address research questions effectively, simpler classical approaches often can provide elegant and sufficient answers to important questions” (Wilkinson, 1999, p. 598).

Summary

Learning is complex and theorists have been attempting to explain the complex process

of reading for a very long time. Theories can help educators understand their students better (Thomas, 2000; Tracey & Morrow, 2006). The job of educators is to determine which cognitive processes are breaking down when students struggle with reading. Assessment, both formal and informal, can offer valuable information in this search, particularly when it investigates the five foundational sub-skills of reading. Reading instruction for disadvantaged students should focus on these five foundations of reading (i.e., phonemic awareness, phonics, fluency, vocabulary, and comprehension (NRP, 2006; Foorman & Torgesen, 2001; Snow et al., 1998; Torgesen, 2000). Students benefit most from interventions that are grounded in research and are delivered in an intense and explicit manner (Denton et al. 2003; Foorman & Torgesen, 2001; Griffiths & Stuart, 2013; NASP, 2009; NRP, 2006; Ring et al., 2012; Shaywitz, 2003; Snow et al., 1998; Torgesen, 2000).

Although past research has confirmed these points, important questions still remain regarding the duration, setting and with whom the different approaches work best (NICDDH, 2000; Ring et al., 2012). Torgesen (2011) suggested that schools find a way to bring more intense instruction to more children, because once behind it is very difficult for children to catch up with their same-aged peers. There is a disconnect between research and routine practice across school divisions; educators would benefit from finding a way to incorporate research in an efficient way that is economically sustainable (Denton et al., 2003). As Torgesen et al. (2001) pointed out, it is important to remember that “one of the most daunting and clearly defined current challenges for both researchers and practicing educators is to develop, disseminate, and implement methods for teaching reading that will help all children acquire adequate reading skills” (p. 33).

CHAPTER 3: METHODOLOGY

Study Design

Sandoval and Bell (2004) discussed the reality of conducting research in educational settings, pointing out that “an educational psychology that is both useable in a practical sense and scientifically trustworthy cannot proceed without directly studying the phenomena it hopes to explain in its inherent messiness” (p. 199). This intervention took place in an actual classroom and not a laboratory, therefore it was inherently limiting due to difficulty controlling the environment and variables (i.e., timing of program delivery, absence of students, unknown factors that could affect a student’s ability to concentrate such as lack of sleep or food, etc.) (Collins, Joseph, & Bielaczysz, 2004). Collins et al. (2004) explained how experiments based on an intervention design are often used to refine educational programming that have theoretically been based on previous programming “this approach of progressive refinement in design involves putting a first version of a design into the world to see how it works” (p. 18).

Research in the area of special education often depends on single-subject designs to study changes that occur after taking part in an intervention of some kind; information is gathered and analyzed for just one subject at a time (Fraenkel, Wallen, & Hyun, 2015). Cipani (2009) attempted to broaden this view, and explained that, “while many single-case studies produce individual participant data, one need not restrict data collection to individual participants.... simply treat the group as an individual unit” (p. 65). Three characteristics that set these designs apart include: (1) measuring the same behaviour repeatedly; (2) providing each participant with the intervention; and, (3) comparing the performance of each participant to themselves (Cipani, 2009). This type of research often follows an A-B design, which Fraenkel et al. (2015) described as follows,

The basic approach of researchers using an A-B design is to collect data on the same subject, operating as his or her own control, under two conditions or phases. The first condition is the pretreatment condition, typically called ... the baseline period, and identified as A. During the baseline period, the subject is assessed for several sessions until it appears that his or her typical behavior has been reliably determined. The baseline is extremely important in single-subject research since it is the best estimate of what would have occurred if the intervention were not applied...The baseline, in effect, provides a comparison to the intervention condition....Once the baseline condition has been established, a treatment or intervention condition, identified as B, is introduced and maintained for a period of time. (p. 304)

Cipani (2009) found this design to be advantageous for several reasons: (1) educators could determine if intervention strategies were resulting in success; (2) they were easy to implement in a regular school setting; teachers could evaluate progress; and, (3) they were appropriate for piloting new interventions. Research in the area of education continues to expand, and “design experiments were developed as a way to carry out formative research to test and refine educational designs based on principles derived from prior research” (Collins et al., 2004, p. 15).

Of course the A-B design is not without limitations. Collins et al. (2004) suggested that “designs in education can be more or less specific, but can never be completely specified” (p. 17); explaining further that the results are specific to the participants and settings, which can be highly variable. The design does not lend itself to experimental control; however, “certainly, for teachers wishing to find out if some procedure is working, an AB design is a good start point” (Cipani, 2009, p. 87). Educational settings and experimental design research are often

at odds because when instruction is not working for a student the teacher must change what they are doing to meet the students' needs. Sandoval and Bell (2004) explained this conundrum in relation to research,

One of the most commonly faced methodological issues in design-based research is the tension between making an intervention “work” in a complex setting, which often necessitates changing the intervention as it unfolds (in a way that directly mirrors the dynamic, contingent nature of decision making during teaching), with the researchers' need for empirical control, which argues against changing the planned “treatment.” (p. 200)

For this reason, similar to single-case designs, researchers often ask experimental questions rather than stating a hypothesis that must be tested (Gast & Ledford, 2014). Essentially, design experiments are continuously refined, and are intended to “...fill a niche in the array of experimental methods that is needed to improve educational practices” (Collins et al., 2004, p. 21).

Nature of this Investigation

This investigation used secondary data from a large western Canadian urban school division's reading initiative which sought to improve reading outcomes for non-responding students. The program was developed to address the needs of elementary students not meeting reading outcomes. The belief that each child learns differently and that teachers need to use evidence-based instructional practices to individualize programming to meet each child's needs is what led to the development of this intervention (IRA, 2000). The purpose of this research was to analyze the secondary data from the program and describe the effectiveness of improving reading outcomes for students who were achieving two or more

years behind their peers in reading as measured using the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010).

First, in order to gain an understanding of how this intervention program was working for the participants, grade-level reading gains were analyzed based on a variety of demographic categories. This was done to determine if the program appeared to more effective for different groups of learners. Next, participants' data were divided by each individual's grade placement (i.e., two, three or four), then the data were categorized based on the intensity of the intervention which they received (i.e., low (30-44 sessions); average (45-55 sessions); or high (56-70 sessions)). Third, each mean change score between pre- and post-intervention were compared to determine if participants made statistically significant gains. Using data regarding individual gains, students were divided into non-responding and responding categories based on how they performed compared to the entire sample (i.e., below or above the 25th percentile for grade-level reading gains). The non-responding and responding scores were then compared to determine if the two groups performed similarly. Last, the specific number of sessions attended, gains in reading Dolch sight words, and the ability to produce common spelling patterns (i.e., *Words Their Way* (Bear et al., 2008) spelling features) were analyzed to determine if these skills were predictive factors for grade-level reading gains.

Specifically, this study investigated the following research questions:

1. Is there a difference in grade-level reading gains for students based on various demographic groupings (i.e., grade-level, diagnosis status, first language, and gender)?
2. How much of individual grade-level reading gains can be explained by the amount of time (i.e., low, average, high) spent in this tier three intervention program?

3. What is the effect of this tier three intervention on participants' foundational reading sub-skills between pre- and post-intervention time periods, and is the effect similar for non-responding versus responding students?
4. How much variation of individual grade-level reading gains can be explained by the specific number of sessions attended and gains made in foundational sub-skills (i.e., fluently reading Dolch sight words and ability to spell various common spelling patterns correctly)?

Participants and Inclusion Criteria

This tier three intervention program offered by a western Canadian urban school division began in September 2011. The number of elementary schools participating since this program's inception has grown from one elementary school in 2011 to 33 elementary schools in 2014; serving over 300 grades two to four students. The student population attending this intervention was culturally diverse, with approximately 35% First Nations, 55% Caucasian, and 10% other nationalities. In addition, students with various diagnoses (i.e., specific learning disabilities, intellectual disabilities, physical disabilities, other diagnoses, and garden-variety poor readers) and English as additional language (EAL) learners have also been served by this intervention. Several of the participating schools were considered socio-economically disadvantaged, with students taking part in free nutritional programming.

For the current investigation, this school division was able to submit data from September 2013 to December 2014. From this group of 316 students, approximately 140 met various pre-screening criteria. The inclusion criteria included: reading two or more grade-levels below that expected for their grade-level as measured using the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010), no diagnosed intellectual disability

or autism spectrum disorder, and a record of the specific number of sessions the student attended.

Procedure

Each of the programs had a minimum of one resource teacher trained to administer the assessment instruments and plan the intervention accordingly. A one day training in-service was necessary by all staff delivering the program to ensure consistent delivery of instruction and adherence to the data collection protocol. Four educational consultants worked with these resource teachers on an ongoing basis to check-in, ensuring that each instructional component was adhered to, and that data collection continued to drive individual programming of the students.

All material for administration of each assessment was provided to the 33 schools by the school division. Resource teachers were provided professional development regarding assessment procedures and windows for administrative time (i.e., pre-intervention scores during a one week window prior to commencing instruction, and post-intervention scores to be recorded within one week of ending the program). All participating students received the highly structured programming for 100 minutes per day at a ratio of four students to one trained adult (i.e., a resource teacher or educational assistant), but students received varying numbers of sessions. The intensity levels were collapsed, to ensure that enough sessions were attended to be considered intensive in nature, resulting in three categories: low (30-44 sessions), average (45-55 sessions), and high (56-70 sessions).

Measures

Confidence in measurement tools, and minimization of measurement error, are directly related to the properties of validity and reliability (Field, 2013). Field (2013) stated that

validity refers to "...whether an instrument actually measures what it sets out to measure" (p. 12), and reliability refers to "...whether an instrument can be interpreted consistently across different situations" (p. 12). With single-subject design research "...the A-B design fails to control for various threats to internal validity; it does not determine the effect of the independent variable...on the dependent variable... while ruling out the possible extraneous variables" (Fraenkel et al., 2015, p. 305). Another potential threat to internal validity is "...the length of the baseline and intervention conditions..." (Fraenkel et al., 2015, p. 309). This intervention was carried out over a relatively short amount of time (i.e., 30-70 sessions), and the design was replicated with other individuals, with the treatment beginning at different times; therefore, according to Fraenkel et al. (2015) this would reduce "...the likelihood that the passage of time or other conditions are responsible for changes" (p. 305). Field (2013) described the property of reliability as referring to "...whether an instrument can be interpreted consistently across different situations" (p.12). Reliability can also be described as, "...the consistency or stability of test scores and involves the extent to which some attribute has been measured in a systematic and therefore repeatable way" (Lipson & Wixson, 2003, p.387).

The data collected from this school division was secondary data. Students two or more years behind their same aged peers in reading were identified using the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010), making them eligible for this investigation. Pre-intervention measures included the following: Dolch Sight Word lists, the Quick Phonics Screener (Hasbrouck, 2011) or the Learning Disabilities Association of Alberta: Reading Readiness Screener (LDAA, 2011), and *Words Their Way* spelling inventories (Bear et al., 2008). These measures, in addition to the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010) level, were followed up post-intervention.

Grade-Level Reading Ability

Students were identified as eligible participants using the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010). This is a formative assessment tool that measures various components of reading including: fluency, decoding and comprehension abilities (Fountas & Pinnell, 2012). This assessment tool allowed students to choose between a fiction and non-fiction selection for each level of difficulty from level A (easiest) to level Z (most difficult) (Fountas & Pinnell, 2008). Approximately 20 to 30 minutes was used by a trained resource teacher, listening, one-on-one, to each student read. First, the teacher recorded the accuracy and reading rate as the student read aloud, then the teacher asked questions, during a reciprocal discussion, to determine the students' level of comprehension (with potential scores of 7 for books up to level K and potential scores of 10 for levels L and above) regarding the passage (Fountas & Pinnell, 2008). This comprehension conversation paired with the student's accuracy and fluency scores allowed the teacher to determine the student's independent and instructionally appropriate text reading level based on a gradient from A-Z (Fountas & Pinnell, 2008).

Fountas and Pinnell (2008) described a benchmark instructional level as, "the highest level at which a student can read with good opportunities for learning through teaching" (p. 43); and their independent benchmark level as, "the highest level at which a student can read independently" (p. 43); therefore, these would be considered easy by the student. For levels A to K (i.e., kindergarten to end of grade two) a book was considered at a student's independent level if they were able to read with 95-100% accuracy and had the ability to answer at least 5 out of 7 comprehension questions correctly (Fountas & Pinnell, 2008). For levels L and

higher (early grade three and above) students were required to read with 98-100% accuracy, as well as answer a minimum of 8 out of 10 comprehension questions correctly to be considered at an independent level (Fountas & Pinnell, 2008).

This assessment system was field tested over 2.5 years and included 498 students from 22 different schools, ensuring a diverse representation of geographic locations in the United States, socioeconomic status, and cultural populations (Fountas & Pinnell, 2012). The executive summary report was compiled by an outside group of independent researchers (Fountas & Pinnell, 2012). Test-retest reliability for all books leveled A through Z was .97; which showed reliability above the coefficient of .85 which is required to be considered a dependable tool (Fountas & Pinnell, 2012). Fountas and Pinnell (2012) also noted the high correlation of system one to Reading Recovery which is recognized as a reliable reading program by the U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, What Works Clearinghouse (2013). System one (levels A to N) fiction books demonstrated correlations of .94 and non-fiction books demonstrated correlations of .93 (Fountas & Pinnell, 2012); which can be classified as a strong relationship. System two (levels L to Z) books were moderately correlated to the Slosson Word Test; a correlation of .69 for fiction and .62 for non-fiction (Fountas & Pinnell, 2012). As Drs. Fountas and Pinnell (2012) pointed out, it is important to note that the Slosson Oral Reading Test - Revised (SORT-R) simply measured word reading ability in isolation with no comprehension component; therefore, students generally scored better on the SORT-R than on the benchmark system two books.

Progress Monitoring

Dolch word lists. The first instrument used to monitor sight word reading progress,

was the graded Dolch sight word lists. Dolch (1951) developed these lists to assist students with reading fluency due to the high frequency with which they appeared in literature. A plan of elimination and probability was used to develop these as a test of children's knowledge of frequently used words (Dolch, 1951). The 220 words are divided into pre-primer, primer, grade one, grade two, and grade three lists based on frequency in grade appropriate literature.

In order to assess students' fluency with the Dolch lists, one sight word at a time was presented on a flash card to the student. The instructor would allow three seconds for a fluent response prior to providing the student with the word and marking it as unknown. Students could receive a possible score between 0 to 179 (grade two) or 0 to 220 (grades three and four) for correct responses. The reliability for this tool is unknown.

Words Their Way spelling inventories. Bear et al. (2008) developed word lists that represent some of the most common English spelling patterns and ordered these words based on increasing difficulty; the purpose was to assess children's knowledge of these important spelling patterns. Edwards (2003) pointed out that the performance on these spelling inventories directly related to reading achievement of students.

Two spelling inventory tools were developed: the Primary Spelling Inventory (PSI) appropriate for kindergarten to grade three students and the Elementary Spelling Inventory (ESI) appropriate for elementary aged children, but not appropriate prior to grade one (Bear et al., 2008). PSI's alpha coefficients of .90 for the internal consistency reiterate that this is a highly reliable tool; the coefficient of reproducibility for the ESI ranged between .92 and .91 for the various selections (Bear et al., 2008).

Bear et al. (2008) suggested using the ESI if students were able to spell more than 20 out of the 26 words correctly. The PSI used a list of 26 words designed to specifically look at

the ability to spell initial and final consonants, short vowels, digraphs, blends, common long vowels, other vowels, and inflected endings; whereas the ESI used a list of 25 words to focus on all the same features as the PSI, plus syllable junctures, unaccented final syllables, harder suffixes, and bases or roots (Bear et al., 2008). Possible scores on the PSI ranged from 0 to 82, and on the ESI scores ranged from 0 to 87.

Data Collection

An application for Approval of Behavioural Research Ethics was submitted to the Office of Research Services at the University of Saskatchewan on April 10, 2014, and approval was received on April 22, 2014 (BEH#15-119). An application form for permission to conduct research with the school division, outlining the use of secondary data, was submitted to the Coordinator of Research and Measurement on April 13, 2014. Within this application the following de-identified data was requested: participant demographic information (i.e., gender, birth date, grade-level, number of sessions attended, primary language, and any diagnosed conditions); and pre- and post-intervention data (i.e., Fountas and Pinnell instructional reading levels, Dolch sight word scores, and *Words Their Way* (Bear et al., 2008) spelling inventory scores, and phonemic awareness measure scores. Written support, via email, was received May 5, 2014, and the de-identified secondary data was received June 1, 2014.

This investigation focused on secondary data, therefore the testing and intervention plan had already been implemented, so no procedures were necessary to establish testing windows or circulation of testing materials. Fidelity had been established at the onset of this initiative in September 2011 and was maintained by the four consultants employed by the school division. These four consultants lead professional development for all teachers and educational associates involved in the program. In addition, these consultants periodically

visited each program to ensure that the intervention was being implemented and assessed as outlined in the program details.

Prior to release of the data, participants were assigned a number by school division personnel to ensure student confidentiality. All data was organized by year, term, and grade-level. No identifying information of participating schools, teachers, or students was available on the data ensuring no way to identify this information. The risk for this study was minimal because the intervention condition had already taken place prior to this investigation. Results of this investigation will be summarized briefly in a report, and interested school division personnel will be invited to a brief presentation of the findings once the investigation is complete.

Data Analysis

First, the collected secondary data was entered into the Statistical Package for the Social Sciences (SPSS) Version 22 analysis program. Descriptive statistics were used to summarize the data; specifically, measures of central tendency (i.e., means, medians and modes) and measures of variability (i.e., standard deviations, minimums and maximums data points, and frequency distributions) were examined. These descriptive statistics allowed the examiner to use graphs and boxplots, and frequency distributions to detect statistical outliers and check for normality of the data.

The dependent variables used in this investigation were: Fountas and Pinnell grade-level reading gains, Dolch sight word efficiency scores, and *Words Their Way* (Bear et al., 2008) spelling inventory scores. The independent variable was the number of sessions attended at each of three grade-levels (i.e., two, three, and four). This data was collected by resource teachers of each program. When the examiner received the data, participants' pre-

intervention reading levels were screened to ensure they were a minimum of two years below their expected level based on their current grade-level. Next, attendance records were examined to ensure that data for each participant had been included; if no data was available the participant was not eligible for this investigation. Finally, students' diagnosis status was screened to ensure students were not diagnosed with an autism spectrum disorder or an intellectual disability due to the fact that these populations often present with extreme variability in cognitive and communication abilities (APA, 2013a). Those data points were removed from the eligible participants. Learners with other physical disabilities, specific learning disabilities, attention deficit hyperactivity disorders and those designated as English as Additional Language (EAL) learners were included in this investigation.

Research Question 1

The first research question posed was: Is there a difference in grade-level reading gains for students based on various demographic groupings (i.e., grade-levels one, two or three; diagnosis status, physical disability, learning difficulty or disability, or garden variety poor reader; first language, English or other; and gender, male or female)? Nonparametric measures were used due to outlying data points. First, two Kruskal-Wallis H tests were conducted to determine if there were differences amongst participants' grade-level reading gains based on between-group differences (i.e., grade placement and diagnosis status). Next, two Mann-Whitney U tests were conducted to determine if there were differences in grade-level reading gains between EAL and non-EAL learners, and finally between male and female participants.

Research Question 2

The second research question posed was: Is there a statistically significant difference

in grade-level reading gains for students' that were two or more years behind their peers based on the amount of time spent in this intense tier three reading intervention program? In order to determine if statistically significant differences were present for varying intensity level groups (i.e., low (30-44 sessions), average (45-55 sessions), high (56-70 sessions)), an analysis of variance (ANOVA) was conducted for the grade two data because the assumptions required were met (e.g. no significant outliers, approximately normally distributed, sphericity, and homogeneity of variance (Field, 2013; Laerd, n.d.) . Unfortunately, the grades three and four data contained outliers, so Kruskal-Wallis H tests (rank-based nonparametric tests) were used to determine if statistically significant differences were evident between the three independent intensity level groups.

Research Question 3

The third research question posed was: What is the effect of this tier three intervention on participants' Dolch word reading gains and *Words Their Way* (Bear et al., 2008) feature points spelling gains between pre- and post-intervention time periods, and was the effect similar for non-responding versus responding students? First, two paired-samples t-tests were carried out to determine if the pre- and post-intervention mean difference changes of two sub-skills (i.e., Dolch word reading gains and *Words Their Way* (Bear et al., 2008) feature points spelling gains) were statistically significant. Fuchs and Fuchs (2005) stated that the most at-risk students are those that fall below the 25th percentile in reading; therefore, student data was divided into non-responding (those below the 25th percentile for grade-level reading gains) and responding (those above the 25th percentile for grade-level reading gains) participants based on the entire sample of 140 students. Once separated, two paired-samples t-tests were used to compare the mean gains of the two groups.

Research Question 4

The fourth research question posed was: How much variation of an individual's grade-level reading gains can be explained by the specific number of sessions attended, gains made in fluently reading Dolch sight words, and gains in the ability to spell various common spelling patterns correctly? A multiple regression was conducted to determine the predictive power of the specific number of sessions attended, gains made in fluently reading Dolch sight words, and gains in the ability to spell various common spelling patterns correctly on each individual's grade-level reading gains. Descriptive statistics, correlations, model summary, ANOVA, and coefficients were included in this examination.

In the fourth chapter of this investigation the results of the data analyses are presented. In the final chapter, implications of these results are discussed and suggestions moving forward are presented.

CHAPTER 4: RESULTS

Overview

This investigation used a one-group pretest posttest design. The main purpose of this investigation was to describe and explore the effectiveness of a reading intervention program being used in a western Canadian school division. This division targeted readers who performed two or more grade-levels behind their peers on reading outcomes based on the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010). Secondary data was submitted by this school division. First, descriptive statistics (i.e., population demographics, participant demographics, frequencies, means, and standard deviations, etc.) were summarized to gain a better understanding of the intervention and the participants involved. Second, demographic information, reading sub-skill gains, and grade-level reading outcomes were investigated to determine if relationships existed among and between participants based on the amount of time spent attending the program.

This chapter begins with a description of the research design, the population demographics, and the specific participants involved in this investigation. The descriptive statistics are followed by the analyses of the relevant research questions. First, Kruskal-Wallis H tests and Mann-Whitney U tests were conducted to determine if there were differences in the grade-level reading gains measured by the Fountas and Pinnell Benchmark system (Fountas & Pinnell, 2010) amongst various demographic groups (i.e., grade assignment, diagnosis status, first language status, and gender). Next, analyses using analysis of variance (ANOVA) and Kruskal-Wallis H tests were carried out to determine if differences in grade-level reading gains were associated with the level of attendance by participants. Third, a comparison of the means of two assessment tools used by the division pre- and post-

intervention were analyzed to determine if statistically significant gains were being made by students. The analysis was broken down further to investigate if non-responding (i.e., those that made grade-level reading gains below the 25th percentile) participants performed as well as responding (i.e., those that made grade-level reading gains above the 25th percentile) participants. Finally, a multiple regression analysis was conducted to determine if the specific number of sessions, gains in Dolch sight word reading ability, and *Words Their Way* (Bear et al., 2008) common spelling patterns could be used to predict the grade-level reading gains made by students. A conclusion summarizes the results from these analyses.

Descriptive Statistics

Three hundred and sixteen students took part in this intervention between September 2013 and December 2014 (i.e., three separate time blocks). Each of these students were selected for eligibility for this program based on underachievement in reading as measured using the Fountas and Pinnell Assessment System (Fountas & Pinnell, 2010). In addition, eligible students had their pre-intervention scores recorded using a number of other reading skills measures (i.e., Dolch sight word reading efficiency, phonemic awareness scores, and *Words Their Way* (Bear et al., 2008) spelling inventory scores). Only those students that met inclusion criteria (i.e., minimum of two years behind in reading, not diagnosed with an intellectual disability or autism spectrum disorders) had their data analyzed. Students diagnosed with intellectual disabilities or autism spectrum disorders were excluded from this study due to the diverse range of intellectual capacity, as well as the communication challenges faced by these populations (APA, 2013a).

Population Demographics

This study examined secondary assessment data provided by an urban western Canadian

school division. Between September 2013 and December 2014, data was collected for a total of 316 grades two through four tier three students from 33 public elementary schools. Of the 316 participants, there were 159 male students and 157 female students (50.3% males and 49.7% females). There were 30 English language learners and 286 students that spoke English as a first language, representing 9.5% and 90.5% respectively. Thirty students were diagnosed with a learning difficulty or disability, 13 diagnosed with an intellectual disability, four diagnosed with autism spectrum disorder, six diagnosed with a physical disability, and 263 had no special diagnoses; representing 9.5%, 4.1%, 1.3%, 1.9%, and 83.2% of the sample respectively. The descriptive data for all students that received tier three programming is provided in Table 1.

Participant Demographics

There were 140 students who met inclusion criteria for this investigation. The sample consisted of 67 male students and 73 female students, equating to 47.9% males and 52.1% females. There were 24 EAL learners and 116 students that spoke English as a first language, who comprised 17.1% and 82.9%, respectively. The sample population also included 16 participants with a diagnosed learning difficulty or disability, three diagnosed with a physical disability, and 121 with no diagnosed disability, representing 11.4%, 2.1%, and 86.4% of the sample, respectively. The descriptive data for participating students is provided in Table 2.

Overall, student's taking part in this intervention made mean gains of 1.03 grade-levels with a standard deviation of 0.47 grade-levels. Only one participant failed to make any growth and 25.7% made growth that would not be sufficient to eventually reach their appropriate grade-level. In contrast, 74.3% made gains that would result in closing the gap between the participant and their same-aged peers. Table 3 shows the frequency of students that achieved various grade-level gains.

Table 1

Descriptive Statistics for Tier three Students between September 2013 and December 2014.

Variable	n	%
Gender:		
Male	159	50.3
Female	157	49.7
Status:		
SLD	30	9.5
PD	6	1.9
ID	13	4.1
ASD	4	1.3
None	263	83.2
First Language:		
English	286	90.5
EAL	30	9.5

Note. SLD = Specific Learning Disability; EAL = English as an Additional Language; PD = Physical Disability; ID = Intellectual Disability; ASD = Autism Spectrum Disorder; n = sample size; % = percentage.

Research Question Results

Research Question 1

The first research question posed was: Is there a difference in grade-level reading gains for students based on various demographic groupings (i.e., grade-level, diagnosis status, first language, and gender)?

Two Kruskal-Wallis H tests were conducted to determine if there were differences amongst participants' grade-level reading gains based on between-group differences (i.e., grade placement and diagnosis status). First, an analysis was conducted to determine if there were

Table 2

Descriptive Statistics for Tier three Students that met Inclusion Criteria.

Variable	n	%
Gender:		
Male	67	47.9
Female	73	52.1
Status:		
SLD	16	11.4
PD	3	2.1
None	121	86.4
Grade:		
Two	31	22.1
Three	30	21.4
Four	79	56.4
First Language:		
English	116	82.9
EAL	24	17.1
Intensity:		
Low	33	23.6
Average	61	43.6
High	46	32.9

Note. SLD = Specific Learning Disability; EAL = English as an Additional Language; PD = Physical Disability; n = sample size; % = percentage.

differences in grade-level reading improvement scores based on participants' grade-level placement: *two* (n=31), *three* (n=30), and *four* (n=79). Distributions of grade-level reading improvement scores were not similar for all groups, as assessed by visual inspection of a boxplot. Grade-level reading improvements increased from grade three (Mean Rank = 63.87),

Table 3

Descriptive Statistics for Tier three Students Grade-Level Reading Gains.

Grade-Levels	n	%
.00	1	0.7
.25	2	1.4
.50	33	23.6
.75	7	5.0
1.00	53	37.9
1.25	13	9.3
1.50	21	15.0
1.75	3	2.1
2.00	4	2.9
2.25	1	0.7
2.50	1	0.7
2.75	0	0.0
3.00	1	0.7
Total	140	100.00

Note. Grade-Levels = per quarter; n = sample size; % = percentage.

to grade four (Mean Rank = 70.18), to grade two (Mean Rank = 77.74), but the differences were not statistically significant, $\chi^2(2) = 1.934$, $p = .380$. These results indicate that the distribution of grade-level gains is similar across the three graded categories, with gains being made regardless of the age of the student; although, the younger students had the highest mean rank scores.

The second Kruskal-Wallis H test was conducted to determine if there were differences in grade-level reading gain scores and participants' diagnosis status: *no diagnosis* (n=121), *physical disability* (n=3), and *learning/attentional disability* (n=16). Distributions of

grade-level reading improvement scores were not similar for all groups, as assessed by visual inspection of a boxplot. Grade-level reading improvements increased from participants' with physical disabilities (Mean Rank = 36.67), to those with learning/attentional disabilities (SLD/ADHD) (Mean Rank = 61.25), to participants with no diagnosis status (garden-variety poor readers) (Mean Rank = 72.56), but the differences were not statistically significant, $\chi^2(2) = 3.482$, $p = .175$. This indicates that the distribution of grade-level gains is similar across the three diagnosis categories, and the intervention appears to be working effectively for students regardless of diagnosis status.

Next, two Mann-Whitney U tests were conducted to determine if there were differences in grade-level reading gains between: (1) EAL learners and non-EAL learners, and (2) male and female participants. First, the test was run to determine if there were differences in grade-level reading gains between EAL and non-EAL learners. Distributions of the scores for EAL and non-EAL learners were similar as assessed by visual inspection. Grade-level reading gain scores were not statistically different between non-EAL (Mean Rank = 68.45) and EAL (Mean Rank = 80.40) students, $U = 1\ 629$, $z = 1.363$, $p = .173$.

A second Mann-Whitney U test was run to determine if there were differences in grade-level reading gains between male and female participants. Distributions of the scores for male and female learners were similar as assessed by visual inspection. Grade-level reading gain scores were not statistically significantly different between female (Mean Rank = 69.49) and male (Mean Rank = 71.60) students, $U = 2\ 371.5$, $z = -.320$, $p = .749$. This indicates that the distribution of grade-level gains is similar regardless of the participants' gender.

Research Question 2

The second research question posed was: At each of three grade-levels, is there a statistically significant difference in reading gains for students' that were two or more years behind their peers based on the time spent (i.e., low (30-44 sessions), average (45-55 sessions), or high (56-70 sessions) in an intense tier three reading intervention program?

The grade two data supported analysis using a one-way analysis of variance (ANOVA). The analysis was conducted to determine if Fountas and Pinnell (2010) grade-level reading gains (difference scores) were different for groups that experienced varying intensity levels of intervention. Participants were classified into three groups: low (n=6), average (n=14) and high (n=11) intensity levels. There were no outliers, as assessed by the boxplot; data was normally distributed for each group, as assessed by the Shapiro-Wilk test ($p > .05$); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ($p = .259$). Data is presented as mean \pm standard deviation. The reading gain scores were not statistically significantly different between different intensity levels, $F(2,28) = 1.418$, $p = .259$, $\omega^2 = 0.03$. Reading level gain scores increased from the low (M=3.2, SD= 1.6), to high (M=3.2, SD= 1.8) to average (M=4.4, SD= 2.1) intensity groups, in that order. Tukey-Kramer post hoc analysis revealed: the mean increase from low to average (1.2, 95% CI [-1.2, 3.54]) was not statistically significant ($p = .43$); the mean increase from high to average (1.2, 95% CI [-.76, 3.11]) was not statistically significant ($p = .31$); and the mean increase from low to high (.02, 95% CI[-2.4, 2.5]) was not statistically significant ($p = 1.00$). Although significant differences were not found, the mean score improvements were highest for the students in the average intensity group of instruction (see Figure 1).

The grades three and four data contained genuinely unusual values (i.e., outliers). The

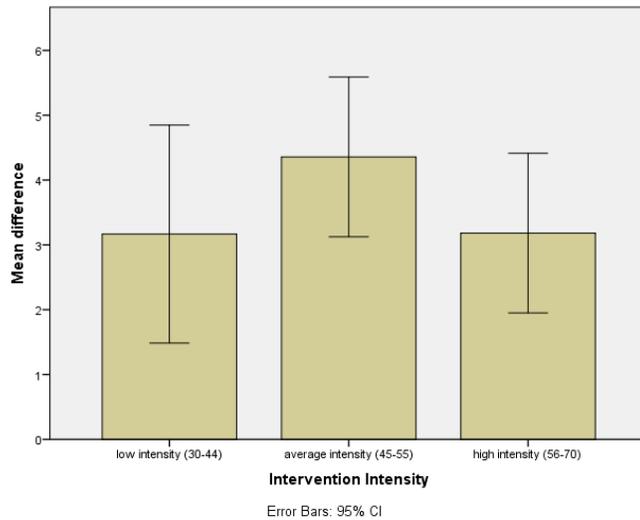


Figure 1. Reading gains comparisons for grade two students attending different intensity levels of instruction.

Kruskal-Wallis test “...assesses the hypothesis that multiple independent groups come from different populations, so we use it to look for differences between groups of scores when those scores have come from different entities...” (Field, 2013, p. 236). For grade three students, a Kruskal-Wallis H test was conducted to determine if there were differences in the reading level gain scores between groups of participants that differed in their level of intervention: low (n=4), average (n=13) and high (n=13) intensity groups.

Distributions of reading level difference scores were not similar for all groups, as assessed by visual inspection of a boxplot. Reading level difference scores increased from the average and high intensity groups (mean ranks = 14.58), to low (mean rank = 21.50) intensity group, but the differences were not statistically significant, $\chi^2(2) = 2.323$, $p = .313$. Although significant differences were not found, the mean rank scores for the four students in the low intensity group were highest (see Figure 2).

For grade four students, a Kruskal-Wallis H test was conducted to determine if there were differences in the reading level gain scores between groups of participants that differed

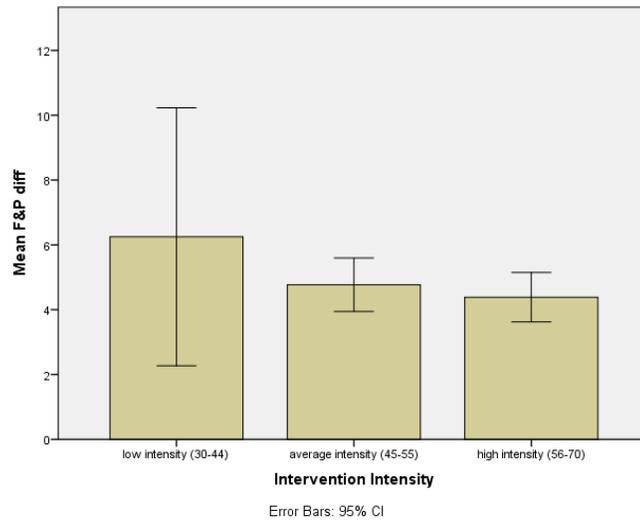


Figure 2. Reading gains comparisons for grade three students attending different intensity levels of instruction.

in their level of intervention: low (n=23), average (n=34) and high (n=22). Distributions of reading level difference scores were not similar for all groups, as assessed by visual inspection of boxplot. Reading level difference scores increased from low (mean rank = 31.46), to high (mean rank = 42.73), to average (mean rank = 44.01) intensity groups, but the differences were not statistically significant, $\chi^2(2) = 4.746$, $p = .093$. Although significant differences were not found, the mean rank scores of students in the average intensity group were highest, but close to gains made by the high intensity group (see Figure 3).

Research Question 3

The third research question posed was: What is the effect of this tier three intervention on participants' reading of Dolch sight words and gains spelling *Words Their Way* (Bear et al., 2008) feature points between pre- and post-intervention time periods, and is the effect similar for non-responding versus responding students?

The ability to read common sight words (i.e., Dolch sight words) and the ability to recognize and spell common spelling patterns has been tied to successful reading and

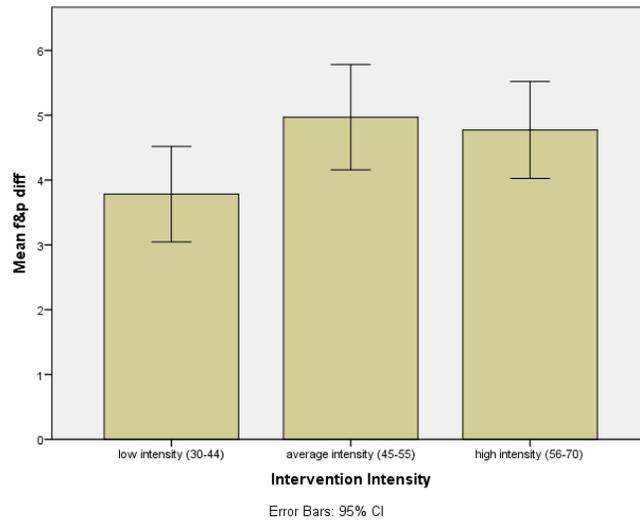


Figure 3. Reading gains comparisons for grade four students attending different intensity levels of instruction.

flexibility when attempting to decode new words (Dolch, 1951; Stanovich, 1980; Snow et al., 2008; NICHD, 2000; Torgesen, 2001; Lipson & Wixson, 2003; Bear et al., 2008; McCardle et al., 2008), therefore these skills were monitored throughout the intervention. Two separate paired-samples t-tests were used to determine if the pre- and post-intervention mean difference changes between Dolch sight word reading and the *Words Their Way* (Bear et al., 2008) feature points were statistically significant. The reported data include mean \pm standard deviation and confidence intervals.

Preliminary analyses of the Dolch sight word reading gains resulted in one outlier that was more than 1.5 box-lengths from the edge of the box in the boxplot. The gain (185) was changed to a less extreme value by using the next highest value (150) and adding one to maintain the rank of the larger score. Analysis of the *Words Their Way* (Bear et al., 2008) feature point gains resulted in three outliers (valued at 41, 38, and 33) that were more than 1.5 box-lengths from the edge of the box in the boxplot. The values were changed to less extreme values by using the next highest value (29) and adding one, two, and three to maintain the

ranks of the larger scores.

Table 4 summarizes the results of the assessment of reading Dolch sight words and *Words Their Way* (Bear et al., 2008) feature points for all tier three students that met inclusion criteria. The results from the t-tests, means, standard deviations, and significance have been reported.

Dolch sight word reading gain scores were normally distributed, with a skewness of 1.34 (SE = 0.213) and kurtosis of -0.88 (SE = 0.423). Participants read more Dolch sight words post- intervention (158.12 ± 57.38) compared to pre-intervention (94.53 ± 64.08), a statistically significant increase of 63.60 (95% CI, 56.87 to 70.32) words, $t(128) = 18.706$, $p < .0005$, $d = 1.65$. This effect size is considered a large effect as it is greater than 0.80 (Cohen, 1988), suggesting a practical significance for these tier three students. The *Words Their Way* (Bear et al., 2008) feature points scores were normally distributed, with a skewness of 2.05 (SE = 0.209) and kurtosis of 0.05 (SE = 0.414). Participants were able to spell more *Words Their Way* (Bear et al., 2008) feature points post-intervention (33.90 ± 9.79) compared to pre-intervention (22.96 ± 10.78), a statistically significant increase of 10.93 (95% CI, 9.49 to 12.37) features, $t(134) = 15.014$, $p < .0005$, $d = 1.29$. This effect size is considered a large effect as it is greater than 0.80 (Cohen, 1988), suggesting a practical significance for these tier three students.

The second part of this analysis describes the effect of this tier three intervention on the most at-risk, *non-responding* participants' foundational reading skills pre- and post-intervention time periods. First, the student data was divided based on the identification of *non-responding* participants (i.e., those that fell below the 25th percentile for grade-level reading gains after the intervention). Then, two separate paired-samples t-tests were used

Table 4

*T-Test Results for Paired Samples Statistics for Dolch and Words Their Way (WTW)**Gains.*

Pairs	<i>M</i>	<i>N</i>	<i>SD</i>	<i>Std. Error Mean</i>	<i>t</i>	<i>Sig (2 tailed)</i>
Pair 1 (Dolch)					18.706	.000
Pre-intervention	94.53	129	64.077	5.642		
Post-intervention	158.12	129	57.384	5.052		
Pair 2 (WTW)					15.014	.000
Pre-intervention	22.96	135	10.781	.928		
Post-intervention	33.90	135	9.794	.843		

Note. M = mean; N = sample size; SD = Standard Deviation; WTW = Words Their Way.

to determine if the pre- and post-intervention mean difference changes between Dolch sight word reading and the *Words Their Way* (Bear et al., 2008) feature points were statistically significant for those below the 25th percentile cutoff compared to those above this threshold. The reported data include mean \pm standard deviation. Table 5 summarizes the results of these differences for participants deemed non-responders.

For *non-responding* students, preliminary analyses of the Dolch sight word reading gains resulted in three outliers that were more than 1.5 box-lengths from the edge of the box in the boxplot. The gains (145 and 150) were changed to a less extreme value by using the next highest value (127) and adding one and two respectively, to maintain the rank of the larger scores. The outlier with the lower score (-42) was changed to the next lowest score (2) minus one to maintain the rank of the lower score. Dolch sight word reading gain scores were normally distributed, with a skewness of 1.14 (SE = 0.403) and kurtosis of -

Table 5

Comparison of Foundational Reading Skills Pre- and Post-Intervention for those deemed Non- Responders (below 25th percentile).

Pairs	<i>M</i>	<i>N</i>	<i>SD</i>	<i>Std. Error Mean</i>	<i>t</i>	<i>Sig (2 tailed)</i>
Pair 1 (Dolch)					8.909	.000
Pre-intervention	93.59	34	50.038	8.581		
Post-intervention	153.88	34	52.194	8.951		
Pair 2 (WTW)					7.223	.000
Pre-intervention	21.17	35	9.784	1.654		
Post-intervention	32.43	35	9.027	1.526		

Note. M = mean; N = sample size; SD = Standard Deviation; WTW = Words Their Way.

0.36 (SE = 0.788). Participants read more Dolch sight words post-intervention (153.88 ± 52.19) compared to pre-intervention (93.59 ± 50.04), a statistically significant increase of 60.29 (95% CI, 46.53 to 74.06) words, $t(33) = 8.909$, $p < .0005$, $d = 1.53$. This effect size is considered a large effect as it is greater than 0.80 (Cohen, 1988), suggesting a practical significance for these non-responding tier three students.

Analysis of participants' considered non-responders *Words Their Way* (Bear et al., 2008) feature point gains resulted in no outliers. The *Words Their Way* (Bear et al., 2008) feature points scores were normally distributed, with a skewness of 0.94 (SE = 0.398) and kurtosis of 0.23 (SE = 0.778). Participants were able to spell more *Words Their Way* (Bear et al., 2008) feature points post-intervention (32.43 ± 9.03) compared to pre-intervention (21.17 ± 9.78), a statistically significant increase of 11.26 (95% CI, 8.09 to 14.43) features, $t(34) = 7.223$, $p < .0005$, $d = 1.22$. This effect size is considered a large effect as it is

greater than 0.80 (Cohen, 1988), suggesting a practical significance for these tier three students.

Table 6 summarizes the results of the assessment of reading Dolch sight words and *Words Their Way* (Bear et al., 2008) feature points for tier three students that were not considered non-responders, and performed higher than the 25th percentile. The means and standard deviations have been reported.

For students that responded to the intervention (i.e., those that made grade-level reading gains greater than the 25th percentile), preliminary analyses of both Dolch sight wordreading gains and *Words Their Way* (Bear et al., 2008) feature point gains resulted in no outliers. Difference scores for both variables were normally distributed, with a skewness of 1.89 (SE= .241) and kurtosis of 0.05 (SE = .478) for Dolch word reading gains; and, a skewness of 1.89 (SE = 0.241) and of .05 (SE = .478) for *Words Their Way* (Bear et al., 2008) feature point gains.

Responding participants read more Dolch sight words post-intervention (159.64 ± 59.32) compared to pre-intervention (94.86 ± 68.64), a statistically significant increase of 64.78 (95% CI, 56.95 to 72.61) words, $t(94) = 16.422$, $p < .0005$, $d = 1.68$. These effect sizes are considered large as they are greater than 0.80 (Cohen, 1988), suggesting a practical significance for these responding tier three students. Participants were able to spell more *Words Their Way* (Bear et al., 2008) feature points post-intervention (34.41 ± 10.04) compared to pre-intervention (23.59 ± 11.09), a statistically significant increase of 10.82 (95% CI, 9.12 to 12.45) features, $t(99) = 13.156$, $p < .0005$, $d = 1.32$. This effect size is considered a large effect as it is greater than 0.80 (Cohen, 1988), suggesting a practical significance for these tier three students.

Table 6

Comparison of Foundational Reading Skills Pre- and Post-Intervention for those NOT deemed Non-Responders (above the 25th percentile).

Pairs	<i>M</i>	<i>N</i>	<i>SD</i>	<i>Std. Error Mean</i>	<i>t</i>	<i>Sig (2 tailed)</i>
Pair 1 (Dolch)					16.422	.000
Pre-intervention	94.86	95	68.641	7.042		
Post-intervention	159.64	95	59.319	6.086		
Pair 2 (WTW)					13.156	.000
Pre-intervention	23.59	100	11.087	1.109		
Post-intervention	34.41	100	10.041	1.004		

Note. M = mean; N = sample size; SD = Standard Deviation; WTW = Words Their Way .

Research Question 4

The fourth research question posed was: How much variation of an individual’s grade-level reading gains can be explained by the specific number of sessions attended, improvements made in fluently reading Dolch sight words, and gains in the ability to spell various common spelling patterns correctly?

In order to determine if there was predictive value of the combined independent variables (i.e., predictors) a multiple regression was conducted. Regression analyses make it possible to predict future outcomes of our dependent variable based on the predictor variables (Field, 2013). The predictors for this research question included the number of sessions attended, Dolch gains, and *Words Their Way* (Bear et al., 2008) gains. Researchers have considered these factors that have a positive effect on reading outcomes (Dolch, 1951; Stanovich, 1980; Snow et al., 2008; NICHD, 2000; Torgesen, 2001; Lipson & Wixson, 2003;

Bear et al., 2008; McCardle et al., 2008). This multiple regression was done to determine the predictive power of the independent variables on the dependent variable. The assumptions of linearity, independence of errors, homoscedasticity, unusual points and normality of residuals were all met. This examination included descriptive statistics, correlations, model summary, ANOVA, and coefficients.

The three variables did not statistically significantly add to the prediction of reading gains, $F(3, 120) = .220$, $p = .083$, $\text{adj. } R^2 = .012$. None of these variables added statistically significantly to the prediction, $p > .05$. Although these predictors did not statistically significantly predict reading gains, there were meaningful gains made by participants as documented in Table 7. The final number of participants included in the final regression was 124 students. The average reading change for all students was 1.02 grade-levels. The standard deviation of .472 indicates variability in the scores of almost a half grade-level.

Table 8 (see top of next page) summarizes the relationship between each predictor variable and the outcome variable. When considering the independent variables in combination: number of sessions, Dolch gains, and *Words Their Way* (Bear et al., 2008) gains, the results were not statistically significant for number of sessions ($p = .099$), Dolch gains ($p = .638$), or for *Words Their Way* (Bear et al., 2008) gains ($p = .293$). It appears that regardless of the number of sessions, gains in Dolch word reading, and gains in *Words Their Way* (Bear et al., 2008) feature points, the majority of students made gains in reading ability after attending this tier three intervention.

Next, the model summary provided information regarding the correlation coefficient between the predictor variables and the outcome variable. The R value, or multiple correlation coefficient, provides information about the amount of outcome

Table 7

Multiple Regression Analysis of Descriptive Statistics on Grade-Level Reading Gains.

Predictor	Mean	SD	N
Grade-Level Reading Gains	1.02	.472	124
Number of Sessions	51.15	10.115	124
Dolch Gains	62.98	39.243	124
WTW Gains	11.31	8.466	124

Note. SD = Standard Deviation; N = sample size; WTW = Words Their Way

variance that can be explained by the predictor variables, with potential scores between zero and one, and greater values indicating better predictive value (Field, 2013). For this investigation, $R = .190$, which indicates that there is a 2% chance that the variables are correlated. In addition, the Adjusted R Square value, $adj. R^2 = .012$, would suggest that less than 1% of the grade-level reading gains can be predicted by the combined predictor variables (i.e., number of session, Dolch, and *Words Their Way* (Bear et al., 2008) gains). Table 9 summarizes the model summary for the independent variable and Table 10 provides additional information regarding the ANOVA. The analysis of variance confirms that the combination of the number of sessions, Dolch word reading gains, and *Words Their Way* (Bear et al., 2008) feature point gains did not statistically significantly predict the grade-level improvements for these tier three students, $p = .221$.

To predict grade-level reading gains from the number of sessions attended, Dolch gains, and *Words Their Way* (Bear et al., 2008) gains, the equation is as follows: the mean predicted grade-level reading gain = $.571 - (.007 \times \text{number of sessions}) - (.001 \times \text{Dolch gains}) - (.005 \times \text{Words Their Way (Bear et al., 2008) gains})$. The beta value indicated

Table 8

Multiple Regression Analysis for Correlations for Grade-Level Gains (N= 124).

	Grade-Level Gains	Number of Sessions	Dolch Gains	WTW
Pearson Correlation:				
Grade-Level Gains	1.000	.153	.079	.098
Number of Sessions	.153	1.000	.129	-.036
Dolch Gains	.079	.129	1.000	.172
WTW Gains	.098	-.036	.172	1.000
Significance (1-tailed):				
Grade-Level Gains	.	.045	.191	.139
Number of Sessions	.045	.	.077	.345
Dolch Gains	.191	.077	.	.028
WTW Gains	.139	.345	.028	.

Note. N = sample size; WTW = Words Their Way

that grade-level reading gains will increase by 0.15 with each additional session attended, 0.04 for each new Dolch word read, and .10 for each *Words Their Way* (Bear et al., 2008) feature points gained. However, all p-values were above 0.05, demonstrating that the independent variables were not significant predictors of grade-level reading gains.

Summary of Results

This investigation used descriptive statistics and various quantitative analyses to describe Fountas and Pinnell (Fountas & Pinnell, 2010) grade-level reading gains for students that participated in a tier three reading intervention program. A one-group, pretest-

Table 9

Multiple Regression Analysis Model Summary for the Independent Variables.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.190	.036	.012	.469

Note. N = sample size; WTW = Words Their Way

posttest design was used to analyze secondary data collected from a school division in western Canada. Of the 316 students that received this tier three intervention, 140 met inclusion criteria. Participants included 67 male students and 73 female students. Most students were English speaking (n=116); however, a small portion were designated as EAL learners (n=24). Also included in this sample were 16 participants diagnosed with a learning difficulty or disability and three students with physical disabilities. All participants, except one, made reading gains. The mean gains for participants were 1.03 grade-levels, with a standard deviation of 0.47 grade-levels. Significant reading gains, or those that outpaced their peers, were made by 74.3% of the participants.

The first analyses that were conducted compared various demographic groupings. The results suggested that the distribution of grade-level gains was similar across the three graded categories, with gains being made regardless of the age of the student; although, younger students had the highest mean rank scores. Similarly, no statistically significant differences in reading gains were made based on participants' diagnosis status; but, the garden-variety poor readers performed better than those with attentional and/or learning difficulties. Those diagnosed with physical disabilities performed poorest; however, the sample size was very small (n=3) so this result may not be a valid representation. Again, when analyzing gender and language status, the results were not statistically significant;

Table 10

Multiple Regression Analysis of ANOVA for Independent Variables.

Model	Sum of Squares	df	Mean of Squares	F	Sig.
Regression	.985	3	.328	1.491	.221
1 Residual	26.442	120	.220		
Total	27.427	123			

Note. df = degrees of freedom; F = F-ratio

however, the EAL students did perform better than non-EAL students. Gender of students appeared to have little effect on performance.

Second, based on the participants' grade-placement, varying intensity levels were analyzed to determine if reading gains were statistically significantly different for students. Results of these analyses showed no statistically significant differences, suggesting that intensity levels as low as 30 sessions can make a marked difference for tier-three students. Male and female participants' performance was very similar, with no statistically significant differences noted. It is important to remember that the population investigated in this study is not typical. These students have not responded to tiers one and two interventions and face similar challenges when attempting to acquire the skill of reading.

Third, t-tests were conducted to determine if two reading sub-skills associated with reading success (i.e., Dolch sight word reading and *Words Their Way* (Bear et al., 2008) spelling features) changed significantly for participants pre- and post-intervention. Results for the entire participant sample (n=140) suggested significant results; therefore, the sample was divided further. Students below the 25th percentile for grade-level reading gains were classified as *non-responders* and those above the 25th percentile were classified as *responders*.

When considered together, results were indicative of statistically significant differences for Dolch sight word reading ability and *Words Their Way* (Bear et al., 2008) feature point spelling ability for both *non-responders* and *responders*.

Last, a multiple regression analysis was conducted to investigate the predictive value of the independent variables. Results demonstrated that the combination of the number of sessions, Dolch sight word reading gains, and *Words Their Way* (Bear et al., 2008) feature point gains did not statistically significantly predict the grade-level improvements for these tier three students. However, it is important to note that, "...a non-significant result should never be interpreted (despite the fact that it often is) as 'no difference between means' or 'no relationship between variables'" (Field, 2013, p. 75).

CHAPTER 5: DISCUSSION

This study investigated the relationship between an intense tier three reading intervention and changes in grade-level reading outcomes for 140 students who were reading two or more grade-levels behind their same-aged peers as measured by the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010). The purpose of this investigation was to gather information about the effectiveness of the tier three reading intervention and describe improvements in reading ability. The focus of this chapter is to provide an overview of the study and discuss the implications and future directions in regards to this intervention. Specifically, this chapter is organized as follows: (1) an overview of the investigation; (2) conclusions of the analyses; (3) limitations inherent in the design; and (4) implications for practice and future investigations.

Overview of the Investigation

The purpose of this investigation was to study the relationship between the tier three reading intervention program and reading improvements for students that were two or more grade-levels behind their peers. This investigation took place in a western Canadian urban school division and had been piloted in September 2011, continuing to grow until 2015. In order for students to meet the criteria for this investigation they had to be reading a minimum of two grade-levels below their expected ability based on the Fountas and Pinnell Assessment System (Fountas & Pinnell, 2010).

A variety of research questions were established to guide the examination of the submitted secondary data. This western Canadian school division was able to submit data from September 2013 to December 2014. The investigation attempted to determine if participation in this intervention helped tier three students begin to close the gap in grade-level

reading ability with their same-aged peers. Specifically, this study investigated the following research questions:

1. Is there a difference in grade-level reading gains for students based on various demographic groupings (i.e., grade-level (i.e., two, three or four), diagnosis status (i.e., specific learning disability, physical disability, attentional or behavioural difficulties, or garden-variety poor readers), first language (i.e., English or other), and gender (i.e., male or female)?
2. How much of a participants' grade-level reading gains can be explained by the amount of time spent (i.e., low (i.e., 30-44 sessions), average (i.e., 45-55 sessions), or high (56-70 sessions) in this tier three intervention program?
3. What is the effect of this tier three intervention on participants' foundational reading sub-skills between pre- and post-intervention time periods, and is the effect similar for *non-responding* (i.e., those that performed below the 25th percentile in comparison to other participants) versus *responding* students (i.e., those that performed above the 25th percentile in comparison to other participants)?
4. How much variation of a participants' grade-level reading gains can be explained by the specific number of sessions attended and gains made in foundational sub-skills (i.e., fluently reading Dolch sight words and ability to spell various common spelling patterns correctly)?

Snow et al. (1998) discussed the close tie between reading and school success and they highlighted the importance of including current research to guide programming because, “a large number of students who should be capable of reading ably given adequate instruction are not doing so, suggesting that the instruction available to them is not appropriate” (p. 25).

The prevention of reading difficulties is possible, particularly when the implemented programs are based on research and are informed by important instructional and assessment decisions which allow for adjustments to be made in the interest of the learner (Denton et al., 2003; Snow et al., 1998). This type of scientifically-based, peer-reviewed research is characterized by systematic methods, valid data linked to hypotheses, and justified conclusions; and this should guide intervention plans (Allington, 2012).

Wanzek and Vaughn (2014) highlighted that, "...while students without disabilities are improving their reading performance, the performance of students with disabilities is declining" (p. 47). It is important that researchers and educators continue to explore and investigate practices that target these students so that their future outcomes are improved. Outcomes for illiterate students often involve increased criminal activity, higher rates of school drop-out and unemployment, increased emotional stress, and fewer economic opportunities (Blomert and Crépe, 2012; Rucklidge et al., 2009).

Students failing to respond to typical instruction showed evidence of the most success when programs demonstrated several essential features: first, the classroom teacher was well trained in basic reading skills and was able to commit sufficient time to the student requiring specific skill training; second, additional support personnel (i.e., resource teacher or reading specialist) were able to dedicate their time to ensure structured, systematic, explicit instruction in a small group setting; and third, programming was delivered over a sufficient time period (i.e., approximately 30-80 hours) (Denton et al., 2003; Shaywitz, 2003; Snow et al., 1998; Snowling & Hulme, 2014; Torgesen et al., 2001).

Learning to read is complex and when students do not respond to reading instruction, educators must act quickly to ensure that students are automatizing various reading subskills

(LaBerge & Samuels, 1974). Students struggling to learn to read do not need to learn different skills than those students that easily acquire the skill, they just need more time and practice with the skills (Beaton, 2004; Foorman & Torgesen, 2001). Interventions that explicitly focus on the acquisition of the subskills of reading (i.e., visual features, knowledge of vocabulary, automatic sight word recognition, phonemic decoding and comprehension strategies) through the use of meaningful instruction can facilitate comprehension of the text; the ultimate goal of reading (Ehri, 1995; Schunk, 2008; Seidneberg & McClelland, 1989; Stanovich, 1980; Tracey & Morrow, 2006). In order to accelerate reading gains, persistent trouble learning to read should be addressed in less demanding learning situations, with intense and individualized instruction (Denton et al., 2013; Gersten et al., 2009; NICHHD, 2000; Rogers & McClelland, 2014; Snow et al., 1998; Torgesen et al., 2001).

The overarching goal of the intervention in this investigation was to provide explicit and intense instruction to help students get closer to grade-level reading outcome expectations. The investigation explored this tier three reading intervention program and the gains made in reading ability.

Conclusions

A quantitative analysis was used to describe reading ability improvements after participants attended a tier three reading intervention program. Students who met inclusion criteria (i.e., two or more years behind their same-aged peers and students classified as having a specific learning disability, a learning difficulty or disability, physical disability or a garden variety poor reader) had their data analyzed to determine growth in grade-level reading, as measured by the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010) skills and overall reading ability. For the purpose of this study, pre- and post-intervention secondary

data between September 2014 and December 2014 were utilized. The overarching question was: Are these students making substantial grade-level reading gains as measured using the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010)?

Analysis of the descriptive statistics showed that the participating sample consisted of 140 students, of which 67 were males and 73 were females. Of these students, 24 spoke English as an additional language, 16 were diagnosed with a learning difficulty or disability, three had a physical disability, and 121 were considered garden variety poor readers. Overall, students made mean gains of 1.03 grade-levels as measured using the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010); and 74.3% of participants made gains that began to close the gap (i.e., gains of .75 grade-levels or greater) between their same-aged peers.

Research Question 1

Kruskal-Wallis H tests and Mann-Whitney U tests were used to answer the first research question: Is there a difference in grade-level reading gains for students based on various groupings (i.e., grade-level, diagnosis status, first language, and gender)? The analyses considered Fountas and Pinnell Benchmark Assessment (Fountas & Pinnell, 2010) levels that were converted to grade-level equivalents. The purpose of this conversion was to enable comparisons of all students regardless of their grade placement (i.e., two, three or four). The distribution of grade-level reading gains was similar for all participants regardless of the graded categories, diagnosis status, primary language, and gender. No statistically significant differences were noted for the various groupings. Field (2013) pointed out that "...a non-significant result should never be interpreted (despite the fact that it often is) as 'no difference between means' or 'no relationship between variables'" (p. 75). Analysis of the mean ranks

showed that the grade two students made greater gains than the grade three and four participants, and the EAL students performed better than the non-EAL students. These results support the importance of early identification and intervention for struggling readers. In addition, the results support use of this program when planning reading instruction for EAL students.

Ring et al. (2012) argued that children, prior to the end of grade two, performed better than older students; this investigation would support this notion. The results of this investigation also suggest that EAL students who received extra English language reading instruction performed as well as, or better than, their English speaking peers which replicates the findings of Gunn et al. (2000). The fact that this intervention lead to comparable gains for students from diverse demographic groups suggests that continued use of this intervention may be valuable when planning instruction for poor readers.

Research Question 2

The second research question posed was: At each of three grade-levels (i.e., two, three or four) is there a statistically significant difference in reading gains for participants that spent varying times (i.e., low (30-44 sessions), average (45-55 sessions), or high (56-70)) in an intense tier three reading intervention program? First, participants' data were divided by each individual's grade placement (i.e., two, three and four); then, the data were categorized based on the intensity of the intervention which they received (i.e., low (30-44 sessions); average (45-55 sessions); or high (56-70 sessions)). These categories were established based on the mean number of sessions attended (i.e., 51). For ease of categorization the average number of group sessions was established as 50 plus or minus 5. The lowest number of sessions attended by participants was 30. This allowed for a minimum category of 30-44, a difference of 14

sessions, then to determine the upper limit of the number of sessions a range of 14 sessions was used again resulting in the category of 56-70 sessions.

A one-way analysis of variance (ANOVA) was conducted to determine if grade-level reading gains were different for groups that experienced varying intensity levels of intervention. Participants were classified into the three groups: low (n=6), average (n=14) and high (n=11) intensity levels. Results showed that grade-level reading gain scores were not statistically significantly different between different intensity levels; but, scores increased from the low, to high, to average intensity groups. Although significant differences were not found, the mean score improvements for grade two students were highest for the students in the average intensity group.

Again, for the grade three students, participants received differing levels of intervention: low (n=4), average (n=13) and high (n=13) intensity groups. Reading level difference scores increased from the average and high intensity groups, to the low intensity group, but the differences were not statistically significant. Due to the small sample size for the low intensity group, these results should be interpreted with caution. Although there was some variance in these results, they were minimal, these results would again confirm that additional sessions, beyond 55, do not necessarily equate to reading gains.

For grade four students, an acceptable number of participants attended the various intervention levels: low (n=23), average (n=34) and high (n=22) intensity. Reading level difference scores increased from low, to high, to average intensity groups, but the differences were not statistically significant. Similar to the results that were evident with the grade two sample, the group that received the average number of sessions (44-55) appeared to perform the best.

Considered together, these results would not support the notion that more sessions are necessarily better. It appears that for the grade two and four participants, the greatest gains were made when students attended between 45-55 sessions, and additional sessions did not result in greater reading gains. Katzir et al. (2013) argued that groups benefited most from spending extended time in an intervention program, but that the program be delivered during two separate time periods. Faggella-Luby and Wardwell (2011) also suggested that struggling readers "...may require a more intense dosage of explicit instruction over fewer total weeks to achieve adequate response" (p. 46). The results of this analysis would indicate that promising gains are made for students when attending up to 55 sessions.

Research Question 3

The third research question posed was: What is the effect of this tier three intervention on participants' reading of Dolch sight words and gains in spelling *Words Their Way* (Bear et al., 2008) feature points between pre- and post-intervention time periods, and is the effect similar for non-responding (i.e., those that performed below the 25th percentile in comparison to other participants) versus responding students (i.e., those that performed above the 25th percentile in comparison to other participants)? Participants ability to read common sight words (i.e., Dolch sight words) and to recognize and spell common spelling patterns were monitored throughout the intervention because of the connection these skills have with successful reading (Bear et al., 2008; Dolch, 1951; Lipson & Wixson, 2003; McCardle et al., 2008; NICHD, 2000; Snow et al., 2008; Stanovich, 1980; Torgesen, 2001). Results from this study indicated that participants read statistically significantly more Dolch sight words, and they were able to spell more *Words Their Way* (Bear et al., 2008) feature points post-intervention compared to pre- intervention; with large effect sizes suggesting a practical

significance for these tier three students.

The second part of this analysis investigated the effect of this tier three intervention on the most at-risk, *non-responding* (i.e., those that performed below the 25th percentile in comparison to other participants) participants' foundational reading skills pre- and post-intervention time periods. The data was divided based on the identification of *non-responding* participants (i.e., those that fell below the 25th percentile for grade-level reading gains after the intervention). Results for the *responding* (i.e., those that performed above the 25th percentile in comparison to other participants) participants were similar to the *non-responding* students, both of which read statistically significantly more Dolch sight words, and were able to spell more *Words Their Way* (Bear et al., 2008) feature points post-intervention compared to pre-intervention. The effect sizes were considered large, suggesting a practical significance for *non-responding* tier three students.

These findings support the idea that the most disadvantaged readers, given adequate instruction, are capable of acquiring some of the same basic foundational reading skills necessary to become proficient in reading (Denton et al., 2013; Gersten et al., 2009; NICHD, 2000; Snow et al., 1998; Torgesen, 2000; Torgesen et al., 2001;). However, Fuchs and Fuchs (2015) reported that “Researchers know that transferring learning is a major challenge for children with significant learning difficulties” (p. 108). Further research will be necessary to determine how to best help these students transfer this foundational knowledge into contextual reading.

Research Question 4

The fourth research question posed was: How much variation of an individual's grade-level reading gains can be explained by the specific number of sessions attended,

improvements made in fluently reading Dolch sight words, and gains in the ability to spell various common spelling patterns correctly? The predictor variables (i.e., number of sessions attended, Dolch gains, and *Words Their Way* (Bear et al., 2008) gains) did not statistically significantly add to the prediction of grade-level reading gains. Although these predictors did not statistically significantly predict reading gains, there were meaningful gains made by participants. The average reading change for all students was 1.02 grade-levels. It appeared that regardless of the number of sessions, gains in Dolch word reading, and gains in *Words Their Way* (Bear et al., 2008) feature points, the majority of students made gains in reading ability after attending this tier three intervention. It is not surprising that the ability to predict grade-level reading gains would be difficult. Individuals learn in very unique ways. In particular the population of interest for this investigation present with a variety of diverse learning styles, needs and challenges. Although a formula cannot be used to accurately predict the achievement expectations for students it is promising that approximately 74% of students made gains that outpaced their same-aged peers.

This investigation has provided some valuable information regarding various instructional components that have assisted educators in accelerating the reading level gains for students that had achieved a minimum of two years behind expectations. Although these results appear promising it is important that all results are interpreted with caution due to several limiting factors.

Limitations

First, the research questions for this study were limited by the secondary data which was made available for analysis. This was a preliminary investigation which allowed for descriptions of the intervention to be presented. All decisions regarding measurement tools

and administration timelines were made by educational stakeholders of the school division and were chosen to assist educators; therefore, speed, efficiency, and cost were considerations when the tools were chosen. The quantitative analysis of the data allowed for only general inferences to be drawn. It is also noteworthy that the performance of the participants may have been influenced by repeated testing using the same instruments (i.e., Dolch sight word lists and *Words Their Way* (Bear et al., 2008) feature points lists).

A second limitation of this investigation was fidelity of program delivery. Although fidelity regarding the components of each session were clearly outlined and monitored by consultants, no data regarding frequency or performance during these check-ins was submitted. Just as every individual learner is unique, so is every teacher; different delivery styles would make replication of the intervention difficult. Lack of data regarding participants' educational history, attendance, socioeconomic status and motivation would also make replicating the sample challenging.

Third, the main instrument used to assess students' reading ability, the Fountas and Pinnell Benchmark Assessment System (Fountas & Pinnell, 2010), has administration guidelines however this is not a standardized measurement tool which limits the inferences that can be made from the results. This tool is easy to administer and when used correctly provides a lot of information regarding the behaviour of the reader, and subsequently information regarding areas of student weakness. Another limitation of this tool is the unequal number of levels per grade-level. For instance, in grade one, students are expected to move through six levels (E-J), but in grade two students move through three levels (K-M). Therefore, when analyzing the data all letter levels of students' progress needed to be converted to grade-level equivalents.

Fourth, the student population in this investigation was not representative of the overall student population of the school division. Only those students that met stringent inclusion criteria had their data analyzed. These criteria resulted in a small portion of the divisions student population being included in this intervention program, and additional inclusion criteria (i.e., elimination of students based on lack of attendance and diagnoses of autism spectrum disorder or an intellectual disability) established as part of the investigation further limited the number of participants. It would be difficult to transfer the findings from this investigation to other school divisions or other student populations due to the high level of need of these participants. The sample size could be increased by providing data from December 2014 up to the present, in an attempt to increase the power of statistical significance. The use of nonparametric tests in these analyses made it difficult to find statistically significant differences; although, practical significance for educators and the participants was realized with accelerated reading gains.

Fifth, although many of these students had been diagnosed with attentional difficulties or learning disabilities, it is unknown how many students were not yet diagnosed. The data received did not include information regarding those students that educators suspected had a disability. The process of diagnoses is not fast or easy and many times learning struggles do not become apparent until grade one; depending on the learning context and the educational staff involved with the child, a *wait and see* attitude may prevail which results in delayed interventions for many high needs students.

Lastly, because no follow-up data was collected it is difficult to make inferences beyond the scope of the intervention program. Performance on the measures provided was administered within the context of 33 different resource rooms. Questions regarding the

transferability of these skills to the regular classroom and information regarding participants' ability to retain their gains once they are no longer included in the intervention still remain.

Implications for Practice and Future Investigations

This tier three intervention program has demonstrated positive gains in grade-level reading ability for students reading well below expected levels (i.e., two or more grade-levels as measured by the Fountas and Pinnell Benchmark System (Fountas & Pinnell, 2010)) for their grade placement. It appears that the provision of explicit and intense instruction in the foundations of reading are effective in assisting tier three students close the reading gap with their peers. It is promising that the participants of this intervention made gains regardless of various demographic characteristics such as grade (i.e., two, three or four), diagnosis status (specific learning disability, learning difficulty or disability, physical disability, or garden-variety poor reader), first language ability (i.e., English or EAL), and gender (i.e., male or female).

This research indicates that this program may contribute to accelerated reading gains for students that are two or more grade-levels behind their peers. The use of additional standardized assessment tools that allow educators to frequently monitor progress and adjust instruction based on the results is worthy of further investigation. Faggella-Luby and Wardwell (2011) discussed the importance of considering what assessments educators are using to guide their decision making and also suggested that further research in this area was warranted.

A well-planned mixed-methods study design, dependent on randomization and use of standardized tools would have the potential to establish confidence in this intervention program as an effective treatment for tier three students struggling with reading acquisition.

Qualitative data would add rich information regarding the student population and the perceptions of stakeholders (i.e., students, parents, caregivers, and teaching staff). The use of standardized measures would allow researchers to track student progress in a longitudinal fashion and to investigate if gains continue to be maintained beyond the scope of the intervention.

Although it is promising that 74.3% of the participants from this study made gains that would allow them to close the gap in reading skills with their peers, there still remains 25.3% of this group that are either continuing to fall behind or are simply keeping pace with their peers. Torgesen (2007) reported that students should be allotted a proportionate amount of time in an intervention plan to the amount that they are behind in reading (i.e., the more severe the delay the longer they would be expected to require support). Similarly, Snowling and Hulme (2014) pointed out that “we now know that reading problems in many children tend to be persistent, and we really need interventions that are delivered over periods of years (say, from 6 to 9 years of age) with appropriate long-term follow-up to evaluate the effectiveness of such sustained interventions” (p. 305). It is this group of students, or those that fell in the lower 25th percentile, who would provide rich information regarding duration and intensity levels required to achieve gains and maintain them in the future.

To make this intervention economically sustainable it will continue to be important to investigate the optimal amount of time required to make marked gains before students begin to level off. This study demonstrated the need for additional research regarding the amount of time required to achieve statistical gains, as well as the timing of these interventions. Katzir et al. (2013) found that “...it appears that an intervention program that has less total hours, but is spread out over this study allows for the possibility of scaling-up interventions to allow more

children access to fewer hours of reading training” (p. 71). They went on to suggest “...that the most effective intervention combination is a slow introduction to the skills needed to succeed, followed by an intense period to use the skills” (p. 71). Fuchs and Fuchs (2015) argued that “...additional research is needed to identify maximum duration, and whether it is affected by methods of intervention, the personnel who deliver intervention, and student characteristics such as attentiveness of their behavior” (p. 109). Learning is a complex endeavor, and each student arrives at school with a unique set of characteristics that may also factor into their ability to learn (i.e., motivation, language, behavior, and/or social differences) (Tracey & Morrow, 2006).

The intense period of practice using the skills lends itself to inclusion of family members. Snowling and Hulme (2014) believed that it was necessary to extend the intervention beyond the scope of the school; forming collaborative partnerships with parents and peers to potentially improve the literary skills of the struggling student. They went on to explain that,

We believe that one important next step for intervention studies is to take seriously issues to do with pupil motivation. For interventions to be truly effective, it is likely that they will need to increase students’ enjoyment of reading. If this can be achieved, steps then also need to be taken to provide pupils with reading resources that they will use in their own time outside the classroom to practice reading. This may involve web-based, app, and other resources that are suited to different students’ levels of literacy skills and different interests. In short, causal models of reading development that ignore environmental or cultural factors including the home literacy environment may be insufficient for developing optimal interventions. (Snowling & Hulme, 2014, p. 303)

Good readers, or those that scored well on reading tests (i.e., in the upper 10% of their peer group) read a minimum of 20 minutes per day outside of school hours; in comparison, poor readers (i.e., in the lowest 10% of their peer group) read for less than one minute per day (Shaywitz, 2003).

Clearly partnering with parents and caregivers would benefit young learners. Snow et al. (1998) believed that the reading difficulties in the general population could be reduced if students were exposed to print early, and “although not a panacea, this would serve to reduce considerably the magnitude of the problem currently facing schools” (p. 5). Early exposure provides learners with an advantage and, “children provided with this advantage often learn to read with greater ease than their less prepared peers” (Sparks et al., 2013, p. 190). Snow et al. (1998) pointed out that some children learn to read almost effortlessly while others require high levels of exposure and good-quality instruction to be successful readers. Quality instruction that is implemented early with a goal of firmly establishing essential reading skills, particularly in the areas of decoding, reading comprehension and spelling, through the use of engaging activities has been shown to improve outcomes for students (Cipielewski & Stanovich, 1992; Cunningham & Stanovich, 1997; Shaywitz, 2003; Sparks et al., 2013; Snowling & Hulme, 2014).

Teachers vary greatly in regards to their experience teaching reading skills. Reading intervention programs should be delivered by skilled, experienced teachers (Denton et al., 2003; Shaywitz, 2003). It is important that teachers have an understanding of the theoretical underpinnings of reading theory and instruction. Professional development that highlights the major reading theories, as discussed earlier, could promote systematic and explicit delivery of foundational reading skills. Snowling and Hulme (2014) argued that theory and research

needed to be closely related, stating that, “we need well-developed models of reading development in order to plan effective interventions for children with reading difficulties” (p. 305). Educational stakeholders would benefit from partnering with pre-service teacher training programs to ensure that reading theory and instruction in the foundations of reading are prerequisites for all teachers.

Many Canadian communities are welcoming new families from diverse backgrounds. Learners who do not speak English continue to enroll in Canadian schools, and Gunn et al. (2000) reported promising results from a study of EAL readers which implied that non-English speaking students benefited as much as English speaking students when provided supplemental instruction. Results from the current investigation also showed promising results for EAL participants; further study of use of this program with new Canadians may be warranted.

This research investigation into a tier three intervention program being used by one western Canadian school division showed promise. Results showed marked gains, approximating one grade-level or more, for a large proportion of the participants. This warrants further research and moving forward this division may want to consider developing a well-designed mixed methods randomized study to reiterate the preliminary findings of this investigation.

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