The Effects of Self-Graphing Oral Reading Fluency in Tier 2 Response-to-Intervention

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Carolyn M. Hansen

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The Effects of Self-Graphing Oral Reading Fluency in Tier 2 Response-to-Intervention

by

CAROLYN M. HANSEN

has been approved for
the Department of Teacher Education
and The Patton College of Education by

Sara R. Helfrich
Associate Professor of Teacher Education

Renée A. Middleton
Dean, The Patton College of Education
Abstract

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The Effects of Self-Graphing Oral Reading Fluency in Tier 2 Response-to-Intervention

Director of Dissertation: Sara R. Helfrich

This investigation examined oral reading fluency improvement through the use of self-graphing within a Tier 2 Response-to-Intervention (RtI) model. Oral reading rate increased when students actively participated in graphing correct words per minute (WPM) progress within a Leveled Literacy Intervention (LLI) framework. Participants included Tier 2 second graders who were performing academically below grade level in reading. Students received 30 minutes of intensive LLI instruction four times per week. Self-graphing took place once per week during Tier 2 RtI instructional sessions. Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Next oral reading fluency subtests were used as the progress monitoring measure. A multiple baseline across participants design was used to investigate effectiveness of the self-graphing strategy on oral reading fluency improvement. The researcher concluded that self-graphing had a positive effect on correct WPM progress within Tier 2 RtI.

Keywords: AIMSweb, benchmark assessment, curriculum-based measurement, Developmental Reading Assessment 2nd Edition, Dynamic Indicators of Basic Early Literacy Skills Next, DIBELS oral reading fluency subtest, general outcome measures, Leveled Literacy Intervention, oral reading fluency, progress monitoring, Reading Level Assessment, Response-to-Intervention, universal screening, What Works Clearinghouse
Dedication

To my family, whose unwavering love and support made this dissertation possible.

Kyle, you and our beautiful children are my happiness.

Special gratitude to my three loving parents, who encouraged me to never give up;

Mom, you are truly brilliant.
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Words cannot begin to express my gratitude to dissertation chair, Associate Professor Sara R. Helfrich for simply saying “Yes.” My life changed when she agreed to guide me through this process. Her kindness, encouragement, expert critiques and never-ending support inspired me to finish what I started.

The good advice, friendship and support of committee member Dr. Dianne Gut have been invaluable on both an academic and a personal level, for which I am tremendously grateful. Additional thanks to committee members Dr. John Henning and Dr. David Carr for their constructive recommendations and adventure in regard to research and scholarship.

Dr. John Hitchcock introduced me to single-case design methodology many years ago, and his infectious passion for scholarly research inspired me to take risks. I am ever grateful to him for continuing to support this investigation from a distance. My appreciation is extended to the Ohio University Graduate Writing and Research Center for providing me the opportunity to work with expert methodologist, Moira Regan. With her assistance I successfully conducted single-case design visual analyses.

Above all, Kris Valade’s genius, mentorship and vision made it possible for me to write this dissertation. She introduced me to reading interventionist, Gina Henig, who welcomed me into her RtI classroom with open arms.
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Chapter 1: Introduction

In order for most learners to become competent readers, they require explicit instruction. Explicit instruction includes connecting students to previous material, presenting new material in small steps, guiding students through initial practice and conferring with individuals and small groups in order to check for understanding (Rosenshine, 1986). Explicit teaching instruction is used in a Response-to-Intervention (RtI) framework. RtI is an educational problem-solving model with the goal of providing the most effective instruction to and intervention for each student (Allington, 2009; Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2001, 2005; Howard, 2009; Owocki, 2010; Wanzek & Vaughn, 2008).

RtI is one method that can be used by educators to improve student academic achievement. Children are identified as at-risk for academic failure after they have not responded to instruction that is effective for most of the students in a general education setting. RtI provides students with the opportunity to receive quality interventions in order to help close the academic gap between them and their achieving peers (Allington, 2009). Allington states, “Underlying the RtI initiative is the research on early intervention that suggests that many struggling early readers can be caught up to grade level” (p. 19).

The initial goal of RtI is for students to respond to more intensive evidence-based individual or small-group instruction. Teachers may conclude after implementation of specific interventions that a student does not have a learning disability (LD), but rather has not received adequate instruction up until that point. The RtI initiative can prove
successful for students because it is based on improving struggling readers’ access to expert, intensive reading instruction (Allington, 2009; Fuchs, Fuchs, Hintze, & Lembke, 2006).

In this chapter, literacy as a three-tier model that differentiates core reading instruction from supplemental and intervention instruction will be discussed. Specifically, Tier 2 students self-monitoring and use of a self-graphing strategy for improving oral reading fluency are described. The following section provides a brief history of RtI as an early intervention model.

**Early Intervention Model**

Federal education programs such as the Reading Excellence Act of 1998, the No Child Left Behind Act of 2001, and the Individuals with Disabilities Education Act (IDEA) of 2004 (U.S. Department of Education, 2004) have generated an increased interest in what research says about reading instruction. Allington (2009) claims, “The commonality shared by each of these federal laws is that each restricts the use of federal funds except for instructional services and support that have been found to be effective through scientific research” (p. vii). After the reauthorization of IDEA, an intensive effort through RtI has been made to intervene early with students not meeting grade level academic goals. If teachers are able to detect students’ academic weaknesses and effectively implement interventions, students will improve areas of weakness and close the achievement gap.

RtI is useful because it requires educators to intervene early in a child’s academic career. Universally screening all classroom students at the beginning of the school year
allows teachers to identify which children are performing academically below grade level (Fountas & Pinnell, 2013; Fuchs & Fuchs, 2001; Gersten et al., 2009; Howard, 2009; Owocki, 2010). The National Center on RtI (2009) determined that universally screening students identifies or predicts who may be at-risk for poor learning outcomes. These universal screening tests are administered to all students at grade level. RtI systems combine universal screening and interventions for all targeted students.

Including RtI as one of the criteria for identification encourages teachers and parents to start providing interventions to at-risk students immediately, assuming the interventions put in place are successful (Owocki, 2010). This should lead to fewer students being evaluated for special education services later on. Fletcher, Coulter, Reschly, and Vaughn (2004) stated, “Identification models that incorporate RtI represent a shift in special education towards the goals of better achievement and behavioral outcomes for students identified with LD as well as those students at risk for LD” (p. 2). Preparing for this shift requires significant leadership, time, and collaboration among stakeholders.

**Three-Tier RtI Implementation**

Implementing RtI models can take several years, due to staff readiness and capacity to implement practices, so buildings preparing to implement this framework should be willing to accept slow and steady change (Fletcher et al., 2004). Thoughtful reviews should be made of accessible resources so staff can determine the most efficient and effective way to deliver high-quality intensive instruction (Allington, 2009; Fletcher et al., 2004; Fletcher & Vaughn, 2009; Gersten et al., 2009; Owocki, 2010; Teachers
Implementation also involves cooperation and collaboration between general classroom teachers and intervention specialists (Chamberlain, 2006; Cummings, Atkins, Allison, & Cole, 2008). RtI is not meant to be a special education initiative or a method for identification of LD models. An effective RtI model is designed to enhance academic and behavioral outcomes in all students (Fletcher et al., 2004).

Many school districts implement a three-tier system; however some use a multi-tier intervention system with more than three tiers. Each tier focuses on specific interventions based on students’ needs. The TCRWP (2012) determined within the three-tier model, Tier 1 represents the core instructional program which is provided in the general education classroom. All Tier 1 students are screened in the general education classroom to determine academic strengths and identify specific skill gaps. RtI identifies students who are not performing academically at grade level, and the purpose is to assist these students before they fall further behind their grade level peers (Allington, 2009; Gersten et al., 2009; Owocki, 2010).

Tier 2 is instruction intended for students who are not making adequate progress in Tier 1. After the classroom teacher screens each student, those who do not perform at grade level are selected to receive intensive small-group interventions based on their individual reading needs (Allington, 2009; TCRWP, 2012). Tier 2 instruction may be delivered by the school’s RtI Director, trained educational aides, classroom teachers, and special education teachers who may all serve as Tier 2 interventionists. When interventionists increase the frequency of progress monitoring in Tier 2, they are able to
collect sufficient data in order to shift their instruction, making evidence-based decisions about how to meet each child’s needs (Fountas & Pinnell, 2013). Children are placed in Tier 2 based on their universal screening scores. Screening measures may include but are not limited to assessments such as AIMSweb, the Developmental Reading Assessment 2nd Edition (DRA2), Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Next, and the Teachers College Reading Level Assessment.

Tier 3 intensive interventions are provided to students who are not making adequate progress in Tier 2. In addition to increased progress monitoring, interventions may include intensive one-on-one tutoring. If a student still does not adequately progress in Tier 3 he or she may be evaluated by an Intervention Assistance Team and considered for special education services. The Intervention Assistance Team may include general education teachers, special education teachers, educational aides serving as trained interventionists, speech pathologists, and the school principal. Additional testing may be justified and students will continue to receive individualized, intensive interventions targeted to specific skill deficits.

**Tier 2 intervention.** Tier 2 intervention provides evidence-based instruction to improve child outcomes (Gersten et al., 2009; Murawski, 2009). Tailoring intervention plans to meet the needs of individual students (Wright, 2007) requires the use of evidence-based interventions. Gersten et al. (2009) recommended targeting areas such as letter naming fluency, phoneme segmentation, nonsense word fluency, word identification, and oral reading fluency for early screening, and progress monitoring. These early literacy skills are needed in order for students to improve their vocabulary
and comprehension development. Teaching storytelling and retelling strategies will also improve auditory memory. Assessment and instructional materials include, but are not limited to, guided reading, strategy group, utilizing the Benchmark Assessment System (BAS) texts for instruction, Early Reading Inventory (ERI), and leveled literacy intervention (LLI). LLI is specifically designed to deliver supplementary small-group instruction.

**Leveled literacy intervention.** LLI provides explicit instruction and assistance to readers struggling with fluency and comprehension (Fountas & Pinnell, 2013). Fountas and Pinnell (2013) stated:

The LLI system is a small-group, supplementary literacy intervention designed to help teachers provide powerful, daily, small-group instruction for the lowest achieving students at their grade level. Through systematically designed lessons and original, engaging leveled books, LLI supports learning in both reading and writing, helps students expand their knowledge of language and words and how they work. The goal of LLI is to bring students to grade level achievement in reading. (p. 1)

Students who make significant gains may test out of Tier 2 RtI, no longer in need of high intensity LLI. Students qualifying for Tier 2 and receiving targeted levels of instruction such as LLI are commonly progress monitored with curriculum-based measurements (CBM). The TCRWP (2012) stated, “Repeated assessments of student achievement should include curriculum based measures to determine if interventions are resulting in student progress toward age or grade level standards” (p. 11).
**Dynamic indicators of basic early literacy skills (DIBELS) Next.** The current study used Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Next (Good & Kaminski, 2013) as the CBM progress monitoring tool. Subtests in DIBELS are referred to as indicators because they quickly and efficiently provide an indication of a student’s performance in acquiring reading skills. The changing benchmarks allow interventionists to monitor students’ progress using these measures (Good & Kaminski, 2002; Good, Wallin, Simmons, Kame’enui, & Kaminski, 2002). When using DIBELS to progress monitor, oral reading fluency scores can be documented on a weekly basis. Although Tier 2 students are progress monitored regularly, typically, they are not active participants in the scoring process. Students are often unaware of their own fluency development and potential improvements. By introducing Tier 2 students to a self-monitoring component, it was hypothesized that it would encourage them to partake in self-regulated learning.

**Self-monitoring**

Pearson and Gallagher (1983) suggested that when teachers gradually release the responsibility of monitoring to the students themselves, it promotes positive self-perceptions and motivation among learners. Constructive, personal, strategic thinking that is involved in self-regulation can be enhanced through self-appraisal and self-monitoring. Research reveals the importance of student learning that is self-regulated, flexible, and independent (Brown, Bransford, Ferrara, & Campione, 1983; Paris & Winograd, 1988, 1990). One way to engage students in self-regulation is by introducing them to a self-graphing strategy.
**Self-graphing.** Presenting students receiving Tier 2 intervention with an opportunity to graph their oral reading fluency progress gives them an opportunity to self-regulate their own learning. Magnan (2006) stated:

> Self-graphing is a condition in which students record their own results on a graphic display. Self-graphing is an overt physical action performed as a visual supplement to self-monitoring, therefore students can self-monitor their accuracy or performance by quantifiably displaying progress in the form of a graph, and then assessing whether or not they reached their goal. (p. 10)

Findings from single-case design (SCD) research indicated a link between self-graphing and academic improvements in reading, writing, and mathematics (Dunlap & Dunlap, 1989; Gunter, Miller, & Venn, 2003; Reid, 1996; Shimabakuro, Prater, Jenkins, & Edelen-Smith, 1999).

The purpose of the present study was to extend previous research by investigating the effects of a self-graphing strategy on academic reading improvement. Additionally, this study extends previously published research by examining the effects of self-graphing within a Tier 2 LLI framework. A multiple baseline design across second grade participants receiving Tier 2 interventions was administered. It was hypothesized that small-group intensive intervention sessions that included self-graphing would lead to positive effects on reading skills such as oral reading fluency. Students receiving Tier 2 LLI were introduced to a self-graphing strategy at staggered points in time. Self-graphing motivated students to put forth as much effort as possible during LLI sessions and progress monitoring; therefore improving their reading skills. Owocki (2010)
reported that self-motivation is a predictor to Tier 2 RtI and in order for children to take necessary reading risks they must feel positive and confident in their reading ability.

Purpose of the Study

This research examined the effects of self-graphing on the academic reading outcomes, specifically oral reading fluency of second graders receiving Tier 2 interventions. The researcher determined that students’ self-graphing had a positive effect on oral reading rates within a Tier 2 LLI framework. Effects of the LLI combined with self-graphing was measured using DIBELS Next oral reading fluency (DORF) subtests as the progress monitoring tool. A multiple baseline design addressed threats to validity because the self-graphing strategy was introduced to participants at staggered points in time. The lag between each participant’s A-B design allowed for experimental control.

Research Questions

The present study examined the following research questions:

1. What are the effects of self-graphing on Tier 2 second graders’ reading rates, as measured by DORF subtests?
2. How do second graders receiving Tier 2 interventions compare with each other in performance on progress monitoring (self-graphing) correct words per minute (WPM) as measured by DORF?

Significance of the Study

This multiple baseline design is significant because it lead to positive reading outcomes for students receiving Tier 2 RtI. Results confirmed that when students
actively participated in self-graphing correct WPM progress, fluency increased. This investigation provided evidence to support how self-graphing yielded academic improvements in reading. This study is important for students receiving Tier 2 RtI services as well as their parents, teachers, and interventionists. Oral reading fluency increased when students graphed reading rate progress, therefore teachers and interventionists may decide to implement the graphing strategy with all second graders receiving Tier 2 RtI. Educators are in need of useful ways to collect data in order to make informed decisions about how to implement best reading practice.

**Operational definitions.** The following terms are used throughout this dissertation. It is important to understand how each term applies to this study.

**AIMSweb.** Pearson (2013) defined AIMSweb as, “A general outcome measurement, a form of curriculum-based measurement used for universal screening and progress monitoring. This form of brief assessment measures overall performance of key foundational reading skills at each grade level” (p. 1).

**Benchmark assessment.** Heinemann (2014) described a benchmark assessment system (BAS) as, “A series of texts that can be used to identify a student's current reading level and progress along a gradient of text levels over time. The word ‘benchmark’ means a standard against which to measure something” (p. 1).

**Curriculum-based measurement.** Curriculum-based measurement (CBM) is one form of progress monitoring. CBM assessments are brief and maintain steady rather than increasing difficulty. They result in a quantitative value that can be charted over time (Owocki, 2010).
**Developmental reading assessment, 2nd edition (DRA2).** The Developmental Reading Assessment, 2nd Edition (DRA2) is a four-step benchmark assessment that measures each student’s reading proficiency through systematic observation, recording, and evaluating of performance (Pearson, 2013).

**Dynamic indicators of basic early literacy skills (DIBELS) Next.** Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Next is used as a progress monitoring tool. Good and Kaminski (2013) defined DIBELS as, “A set of procedures and measures for assessing the acquisition of early literacy skills. These measures are designed to be short (one minute) fluency measures used to regularly monitor the development of early literacy and early reading skills” (p. 1).

**Dynamic Indicators of oral reading fluency (DORF) subtest.** The Dynamic Indicators of Oral Reading Fluency (DORF) subtest measures fluency and accuracy in reading level passages aloud, by words read correctly per minute.

**General outcome measure.** Kaminski and Cummings (2008) stated that general outcome measures (GOMs), “Measure key skills that are representative of and related to an important global outcome such as reading competence. GOMs include multiple alternate forms of approximately equal difficulty that sample key skills” (p. 4).

**Leveled literacy intervention (LLI).** Fountas and Pinnell (2013) defined Leveled Literacy Intervention (LLI) as, “Small-group, supplementary literacy intervention. The goal of LLI is to bring students to grade level achievement in reading” (p. 1).

**Oral reading fluency.** Oral reading fluency is the level at which a task can be performed at an automatic level—that is, with a minimal amount of attention required for
its completion. It is reading that is accurate, at a reasonable rate, and prosodic (read with enough expression that it sounds like language) (Kuhn & Stahl, 2003; Rasinski & Hoffman, 2003).

**Progress monitoring.** Progress monitoring involves collecting repeated measures of performance to estimate rates of improvement. Progress monitoring assessments are administered anywhere from weekly to monthly.

**Reading level assessment.** The Reading Level Assessment identifies students’ independent reading levels. The assessment defines independent reading as reading orally or silently to self, without assistance. Independent levels A-Z are determined by measuring fluency and comprehension (TCRWP, 2013).

**Response-to-intervention (RtI).** Response-to-Intervention (RtI) is a multi-tiered early intervention model schools implement to provide the most effective instruction to and intervention for students performing academically below grade level.

**Universal screening.** Jenkins, Hudson, and Johnson (2007) stated, “Universal screening, the first step in any prevention approach, is the principal means for targeting students who struggle to learn when provided a strong evidence-based general education (Tier 1) and who require supplemental (Tier 2) instruction” (p. 582).

**What works clearinghouse (WWC).** According to the Institute of Education Sciences [IES] (2013), “The What Works Clearinghouse (WWC) is an important part of IES’s strategy to use rigorous and relevant research, evaluation and statistics to improve our nation's education system” (p. 1).
Delimitations and Limitations

This study is delimited by grade level, geographic location, and a focus on students performing below grade level in reading. Participants included second grade students who received Tier 2 LLI instruction four times per week. This investigation took place in a suburban elementary school located in southeast Michigan. Four students were chosen to participate in the study due to the Tier 2 elementary school groupings. Staggering introduction of a self-graphing treatment throughout the investigation allowed for a small sample size.

Limitations include visual inference, length of time students spent in baseline and intervention phases, using a small sample, and separating self-graphing and LLI from other impacting factors. A dilemma in the use of visual inference is that its use is guided primarily by common sense, with few guidelines available for practitioners (Kratochwill et al., 2010).

The length of time each student spent in baseline and intervention phases limited the study to Meets Standards with Reservations instead of Meets Standards for a multiple baseline design (Kratochwill et al., 2010). Kratochwill et al. stated, “In order to Meet Standards with Reservations a multiple baseline design must have a minimum of six phases with at least three data points per phase” (p. 16). The present investigation made four attempts to demonstrate a self-graphing effect at four different points in time. According to Kratochwill et al. (2010), “In order to Meet Standards, a multiple baseline design must have a minimum of six phases with at least five data points per phase” (p. 16). The study Meets Standards with Reservations because in two cases, less than five
data points were documented per phase. In order for the researcher to determine a SCD effect or non-effect, amount of data points per phase must be considered.

The intention of a SCD is not to generalize. Since a SCD typically entails using a small sample size, it is not a design that is easily generalized to other settings. Utilizing a small sample size limits the ability to make broad statements across a large population. If the treatment has an effect on participants in the multiple baseline design, research cannot conclude that self-graphing will increase reading achievement for all elementary school students. However, this investigation is still useful because the self-graphing results provide teachers, interventionists and special educators with an effective strategy to help improve students’ early literacy skills.

Separating self-graphing and LLI instruction from Tier 1 reading exposure is also a limitation. The amount of reading instruction students received in the general education setting was an impacting factor on reading improvement. When students receive additional individual and small-group instruction in the regular classroom, their reading skills will most likely improve, which also impacts student progress in Tier 2 RtI.

**Summary**

RtI is a multi-tiered early intervention model schools implement to improve student academic achievement. After initial screenings take place, students who are performing academically below grade level are placed in Tier 2 RtI and provided with explicit, small-group instruction. Tier 2 and Tier 3 high-intensity instruction provides evidence-based interventions to students with the goal of improving academic outcomes. Students are progress monitored on a regular basis with CBMs. The current study
extended previously published research by investigating the effects of a self-graphing strategy on academic reading improvement.
Chapter 2: Literature Review

This chapter reviews literature on the process of becoming a fluent reader and Response-to-Intervention (RtI) as an intensive effort made by educators to provide students with high-quality explicit instruction. The RtI model identifies students with reading difficulties and provides them with Tier 2 and Tier 3 instructional support. Universal screening and progress monitoring assessments are administered in order to determine which children are in need of high-intensity instruction. This literature review will also focus on the effects of Tier 2 reading intervention for students performing academically below grade level, and what previous researchers have to say about self-regulated learning.

Process of Becoming a Fluent Reader

The National Reading Panel (NRP, 2000) defined fluency as the ability to read text with speed, accuracy, and proper expression. To read text fluently, with appropriate phrasing and expression, requires that children can read most of the words with little conscious effort. That means they do not have to take time slowing down to sound out many words (Allington, 2006). The focus of work for teachers and reading specialists is the integration of fluency enhancement into all aspects of teaching reading.

Fluency is a key link between word recognition and comprehension (Allington, 1983; Johns, 1993; NRP, 2000; Samuels, 1988; Schreiber, 1980). Readers who struggle with fluency have a difficult time comprehending what they read. When children have low word recognition abilities, it makes it difficult to understand, reflect, and retell what they have read (Bashir & Hook, 2009). If readers stumble through words in a text,
cognitively they are unable to focus on the text’s meaning. Emphasis on practicing oral reading fluency is key to understanding text. Throughout the 20th century, researchers assumed that fluency was a direct result of word recognition proficiency (NRP, 2000), and therefore development of word recognition became the focus instead of fluency itself. Huey (1905) summarized research findings on word recognition and eye movements during reading and stated:

> Perceiving being an act, it is, like all other things that we do, performed more easily with each repetition of the act. To perceive an entirely new word or other combination of strokes requires considerable time, close attention, and is likely to be imperfectly done, just as when we attempt some new combination of movements, some new trick in the gymnasium or new “serve” at tennis. In either case, repetition progressively frees the mind from attention to details, makes facile the total act, shortens the time, and reduces the extent to which consciousness must concern itself with the process. (p. 104)

Current literature tells us that yes, word recognition is an important component of fluency, but speed and prosodic features are equally as important (Allington, 1983; NRP, 2000; Shrauben, 2010). Fluency encompasses accuracy, automaticity, and prosodic features of language.

**Accuracy.** Children’s ability to recognize or decode words accurately is one of the first steps in reading fluently. Beck (1995) claims, “Early attainment of decoding skill is important because this early skill accurately predicts later skill in reading comprehension” (p. 2). The ability to obtain meaning from print depends on the
development of word recognition accuracy and reading fluency (Clay, 2000). Meaning changing errors can impede comprehension (National Assessment Governing Board, 2002), and make it difficult for struggling readers to make connections to the text (Harvey & Goodvis, 2000). Practicing reading orally through repeated readings and guided reading can provide useful feedback for students with reading difficulties (NRP, 2000).

**Automaticity.** The NRP (2000) developed a definition for automaticity that considers and includes various reading behaviors and processes because it takes a substantial amount of time and practice before children can be considered fluent readers. The NRP (2000) definition stated, “The fundamental idea of automaticity requires much more than that information be processed with little effort or attention” (p. 3-7). Automatic processes are attained slowly and with plenty of repetition (Schneider & Shiffrin, 1977).

When considering fluency as a continuum, research tells us to think about reading speed (NRP, 2000). In the early stages of learning to read, speed tends to be slow and sometimes taxing on the reader, however after years of practice, rapid rate of speed can be obtained (NRP, 2000). Researchers address the importance of reading familiar words by accessing them in memory, called sight word reading (Ehri, 2005). With practice, all words come to be read automatically by sight, which is the most unobtrusive way to read words in text. Fluent readers easily recognize most of the words they encounter in text. In addition to being able to decode the words on a page, they also simultaneously comprehend what they are reading. Inefficient word recognition impedes comprehension
and takes up cognitive resources that should be used for understanding (Ehri, 2005; Kuhn, Schwanenflugel, & Meisinger, 2010). Once word recognition becomes automatic, fluent readers are able to spend more reading time making meaning from the text (Hudson, Lane, & Pullen, 2005). In summary, comprehension of the material is much easier for beginning readers if they do not have difficulty with word recognition.

LaBerge and Samuels (1974) introduced one theory regarding automatic information processing in reading. According to Schrauben (2010) their theory, “Describes how visual information is transformed and processed through a series of stages until it is comprehended. Automatic word recognition is defined as quick and effortless identification of words out of context” (p. 84). Educators monitor reading rate in terms of speed, sometimes using the correct number of words read per minute (WPM) or the length of time it takes students to read aloud a text passage (TCRWP, 2012). LaBerge and Samuels (1974) argued that for purposes of building fluency, speed rather than accuracy should be stressed. Although their theory stressed the importance of speed, it is not the only factor researchers consider when determining what makes a fluent reader. Fluency encompasses speed, as well as accuracy and prosodic features of language. The automaticity theory also viewed comprehension as the process of how readers bring meaning to the material they are reading (LaBerge & Samuels, 1974).

Automatic processes are something that occur without intention. In the case of reading, fluent readers appear to unconsciously recognize words as they come across them. Once automaticity develops, the reader’s task gets faster (Kuhn et al., 2010). Eventually, a lack of conscious awareness in decoding and word recognition
differentiates fluent from nonfluent readers (Perfetti & Hogaboam, 1975; Torgesen, 1986). It is important to remember that although the characteristics for automaticity can be applied to automatic word recognition, they may be done at different rates (Kuhn et al., 2010).

**Prosody.** Fluency encompasses more than just automatic word recognition and accurate decoding. The NRP (2000) also defined fluency as, “Reading so that a text sounds like spoken language when read aloud” (p. 3-10). Since understanding of fluency’s role in reading has changed significantly, Dowhower (1991) claimed, “The prosodic reading indicators include, presence or lack of pausal intrusions, length of phrases between pauses, number of appropriate phrases, durations of final words of syntactic phrases, the change of pitch at the final punctuation marks, and stress or accent” (p. 166). Children need to pay attention to punctuation, letting it guide the expression in their voices while reading. Schrauben’s (2010) recent research validated that concept because prosody plays a factor linking fluency to comprehension. It is important to make sure that children’s reading voices are not monotone, robotic, mumbly, or lacking the expression, intonation, and phrasing that reflects the meaning of the story. Kuhn et al. (2010) claimed, “There are still a number of questions surrounding our understanding of what constitutes fluency, its role in the reading process, and how its assessment and instruction fit into the literacy curriculum” (p. 230).

**Established Views of Fluency Development**

The NRP (2000) reported that from approximately 1910 until the middle of the 1950s, small amounts of research were reported on automaticity or reading fluency. Fries
Samuels (1979) eventually determined that fluent readers can process language mapping rapidly and easily. By the 1970s, studies considering concerns such as letter recognition were being conducted (Posner & Snyder, 1975). Schreiber (1980) determined that, “A person must go beyond simply coding words; s/he must learn to group words together into meaningful sequences” (p. 177). Researchers began to investigate instructional practices that reinforced fluency development. Some included repeated reading (Samuels, 1979), paired reading (Topping, 1987), shared reading (Holdaway, 1979), and assisted reading approaches (Coyne, Simmons, Kame’enui, & Stoolmiller, 2004). Snow, Burns, and Griffin (1998) stated, “Adequate progress in learning to read English (or any alphabetic language) beyond the initial level depends on sufficient practice in reading to achieve fluency with different texts” (p. 223).

In regards to comprehension, Samuels (1979) noted, “Comprehension may be poor with the first reading of the text, but with each additional rereading, the student is better able to comprehend because the decoding barrier to comprehension is gradually overcome” (p. 378). When readers are able to spend less time decoding words, more attention can be spent on comprehending the text. Fluency helps with reading comprehension because it frees cognitive resources for interpretation (NRP, 2000).

**Recommendations for addressing fluency.** Even when educators are able to decrease the gaps in students’ reading accuracy and comprehension, the reading fluency gap is still a challenge to close. Children should have strong vocabulary knowledge as well as the ability to use context clues in order to make meaning with unknown words. Snow et al. (1998) stated:
Because the ability to obtain meaning from print depends so strongly on the development of word recognition accuracy and reading fluency, both the latter should be regularly assessed in the classroom, permitting timely and effective instructional response when difficulty or delay is apparent. (p. 7)

The results of a NRP (2000) study also indicated that teachers should assess fluency regularly and stressed the importance of explicit approaches for improving reading fluency.

Fountas and Pinnell (2006) outlined dimensions of fluency to keep in mind when conducting formal and informal reading assessments. They presented a Scale for Assessing Fluency which included pausing, phrasing, stress, intonation, rate, and integration. According to this scale, teachers should find texts that children can read with at least 90-95% accuracy (Fountas & Pinnell, 2006). In order for teachers to evaluate students’ reading abilities the must use a variety of assessments. For example, as a child reads aloud, the teacher makes notes using a rubric, keeping in mind that it is simply a snapshot of the reader at one place in time with one text. Observing reading processes, having students read word lists aloud, conducting informal reading inventories, conducting running records, as well as studying miscues are all ways to assess fluency (Fountas & Pinnell, 2001).

Kuhn et al. (2010) claimed, “Current implementation of fluency instruction in many classrooms is often driven by assessments that build upon an incomplete conceptualization of the construct and can lead to both inappropriate instruction and a misconception of this essential characteristic of skilled reading” (p. 230). Simply
listening to students read aloud helps to assess fluency and enables teachers to determine their instructional needs (Hudson et al., 2005). In the past, instructional procedures such as round-robin reading (Opitz & Rasinski, 1998) gave students little practice actually reading because no one student was allowed to read for long periods of time. This type of instructional practice did not serve the purpose of building fluency in individual readers. More current guided reading approaches (Cunningham & Allington, 1994; Fountas & Pinnell, 2001; Lyons & Pinnell, 2001) provide children with an opportunity to read texts over and over, with the goal of becoming proficient in that specific level of text.

The NRP (2000) reported that oral reading practice that includes feedback will influence the key elements of fluency such as word knowledge, speed, and oral accuracy. Oral reading to self, in pairs, or small peer groups with support and feedback from the teacher can assist in improving fluency with struggling readers (Hudson et al., 2005; NRP, 2000). As fluency increases, readers have a better understanding of what the text is about. Fluent readers may begin to set a purpose before reading.

**Strategic Readers**

Proficient readers are strategic thinkers who do certain things before they read, while they read, and after they finish reading (Anderson & Pearson, 1984). Reading is a complex process because in some way readers have to match their thinking to that of the author (Clay, 2002; Raphael, 1984). Good readers set a purpose before they begin reading to decide if they are reading to find out what happens or if they are reading to learn something. Efferent readers set a purpose to learn something, taking information
away from the text (Rosenblatt, 1995). Aesthetic readers are engaged in the experience of reading, entertained by the text. When children read for meaning they are finding and using information from many sources (Clay, 2002). Proficient readers preview texts by noticing illustrations and important text features such as captions, bold words, headings and graphics. They make predictions about the text before they begin the task of reading.

Anderson and Pearson (1984) determined that good readers are able to bring their own experiences to the text by activating prior knowledge (schema) that allows them to make connections to what they are reading (Allington, 2006; Calkins & Tolan, 2010; Clay, 2005; Fountas & Pinnell, 2006; Harvey & Goudvis, 2000; Miller, 2002). Once proficient readers begin the task of reading, they self-monitor for comprehension (Baker, 1979; DiVesta, Hayward, & Orlando, 1979; Fountas & Pinnell, 2006; Harvey & Goudvis, 2000; Owings, Peterson, Bransford, Morris, & Stein, 1980; Paris & Myers, 1981), and then ask themselves if a word looks right, sounds right, and does it make sense? If unfamiliar words do not make sense, good readers continue reading using context clues to help determine the meaning of a word. Proficient readers adjust their reading depending on the complexity of text. If they get stumped by an unfamiliar word or a paragraph that does not make sense, they go back and reread (Dowhower, 1987; Samuels, 1979), trying to determine the word or make sense of the paragraph. As readers navigate through the text, they continue to predict and confirm as well as envision what is happening. They ask themselves, was I correct and did that make sense? Good readers stop and think, and stop and jot while reading (Calkins & Tolan, 2010; Harvey & Goudvis, 2000). Calkins and Tolan (2010) suggest that strategic readers “Engage in thoughtful discussions, and
especially discussions that incorporate thinking under, between, and around texts” (p. 11). They search for the answers to their questions (Raphael, 1984), and attempt to better understand the text through their connections to the characters, the events, and the issues (Allington, 2006; Atwell, 2007; Calkins & Tolan, 2010; Fountas & Pinnell, 2001; Harvey & Goudvis, 2000).

After proficient readers finish a story, they are able to retell and summarize what happened in the text (Calkins & Tolan, 2010). Good readers draw conclusions based on their earlier predictions and questions and determine the most important concepts in a text (Palinscar & Brown, 1984). Strategic thinkers use graphic organizers as tools to help them prepare to have meaningful conversations about what they read. Finally, good readers are able to synthesize (Brown, Day & Jones, 1983) and write about what they have read, pushing their thinking to make sense of the text (Calkins & Tolan, 2010).

**Developing readers.** Developing readers need to do reading work, especially as they encounter textual challenges that help them build a processing system. Reading work includes word solving, making sources of information fit, puzzling out new vocabulary, noticing punctuation, repeating to confirm, stopping to think and reflect and synthesizing within and across texts (Cunningham & Allington, 1994; Fountas & Pinnell, 2006; Harvey & Goudvis, 2000; Lions & Pinnell, 2001). Struggling readers tend not to form predictions and theories about the text’s meaning before they read (Bruce & Rubin, 1984). They may not effectively use prior knowledge (Maria & MacGinitie, 1980; Spiro, 1980), which makes it difficult for them to connect to the text they are reading. Listening
to a child retell the big or important parts of a passage or story can help teachers discover what he/she connects to real life and to other texts (Snow, 2001).

Children that read with speed and accuracy still need to do reading work in the way of listening to themselves read aloud. In terms of speed and accuracy, if readers do not slow down enough to read with expression (Schreiber, 1980), they are unable to grasp the author’s purpose. This is concerning because children may think they are fluently reading the text, but in actuality, they are missing a lot of important text features that will assist in making meaning of what is being read. Practicing oral reading independently, in pairs, or in small peer groups, can help with prosody (Hudson et al., 2005). Hudson et al. (2005) described prosody as “The rhythmic and tonal aspects of speech: the ‘music’ of oral language” (p. 704). Urging readers to read as if they are having a conversation with the text is one way to encourage practicing prosody (Calkins & Tolan, 2010).

Research suggests teaching developing readers strategies for making connections (Harvey & Goodvis, 2000, Lyons & Pinnell, 2001), asking questions about the texts they read, inferring, and synthesizing within and across texts (Brown et al., 1983). These are all ways to help students conceptualize what they read. Once a child can read fluently at his or her independent reading level, these skills can be fine-tuned during the actual process of reading.

**Reading processes.** Oral reading fluency is an essential part of the reading process and has an effect on overall reading proficiency (NRP, 2000). In their research, Fuchs, Fuchs, Hosp, and Jenkins (2001) claimed, “The execution of a complex skill necessitates the coordination of many component processes within a short time frame. If
each component required attention, the performance of the complex skill would exceed
attentional capacity and therefore be impossible” (p. 241). If readers are able to read with
speed, accuracy, automaticity, and prosody, they will have the capacity to comprehend
the texts they read (Allington, 1983; Johns, 1993; NRP, 2000; Samuels, 1988; Schreiber,
1980). Fuchs et al. (2001) added, “By contrast, if enough components are executed
automatically, then attentional load would be within tolerable limits, permitting
successful performance” (p. 241). There is a consensus among theories of fluency
development that once readers become efficient in these skills, they are able to work
towards becoming a whole reader. An increase in fluency should have a positive impact
on comprehension. Providing students with effective instructional interventions will help
increase their fluency development.

**Instructional intervention.** Educators have a responsibly to teach students how
to become fluent readers because fluency is a prerequisite for comprehension. Chard,
include an explicit model of fluent reading, multiple opportunities to repeatedly read
familiar text independently and with corrective feedback, and established performance
criteria for increasing text difficulty” (p. 386). Researchers and practitioners share a
common goal of defining important features of instructional reading methods that will
allow children to practice the components of fluency in meaningful text (Chard et al.,
2002; Dowhower, 1994; NRP, 2000).

Schrauben (2010) emphasized the need for teachers to implement more fluency-
based instructional practice. It is important for teachers to listen to students read aloud in
order to monitor their progress in reading fluency (Zutell & Rasinski, 1991). Instructional intervention sessions that focus on asking readers to think about the meaning of a sentence or story, chunk text to make it sound smooth, use punctuation as a clue to how text sounds, use clues in the text, and use a storyteller’s voice while reading assist in increasing reading fluency (Collins, 2004).

Researchers emphasize the importance of modeling fluent oral reading to children (Blevins, 2001; Rasinski, 2003). This is often done through teacher read alouds during repeated reading interventions (Chard et al., 2002). The NRP (2000) determined, “It appears that oral reading practice and feedback or guidance is most likely to influence measures that assess word knowledge, reading speed, and oral accuracy” (p. 3-18). Providing children with oral support (Rasinski, 2003), and the opportunity to participate in assisted reading approaches, choral reading, paired reading, the use of audio recordings (Carbo, 1981) and computer programs gives readers the exposure they need to improve their fluency. Allington (2006) recommended that teachers provide young readers with a variety of materials at their independent reading level to practice reading independently. In addition, teachers should also encourage children to use repeated readings of progressively more challenging texts, such as those at an instructional reading level (Chard et al., 2002; Meyer & Felton, 1999; Rasinski, 2003; Samuels, 1979).

Hudson et al. (2005) listed instructional strategies such as readers theater, radio reading, student self-recordings, echo reading, unison reading, and teacher assisted cloze reading as methods that focus on increasing inflection, expression, and, phrasing. Rasinski (2003) and Schrieber (1980) recommended that teachers also encourage prosody
development. For example, cueing pauses in text with single and double slashes assists developing readers in recognizing when to pause at appropriate places in text, which helps them construct meaning from the words in each phrase boundary (Hudson et al., 2005). In order for students to begin comprehending what they read, teachers must first incorporate fluency-based instruction and intervention into the reading programs for struggling readers. As previously mentioned, Fountas and Pinnell’s (2013) LLI system provides explicit small-group reading intervention to students with reading difficulties.

**Leveled literacy intervention.** The goal of LLI as an early intervention model is to accelerate students’ progress in order to bring students’ reading abilities up to grade level performance (Fountas & Pinnell, 2013; Harrison et al., 2008). LLI is administered in 30-minute lessons to low-achieving students who are not receiving other supplementary instruction. Harrison et al. (2008) reported study results that showed meaningful gains in reading ability and claimed, “Student achievement results suggested LLI was effective in quickly providing benefits to struggling readers and writers” (p. 28).

In addition to fluency and comprehension, LLI focuses on providing instruction to increase phonological awareness and oral language (Fountas & Pinnell, 2013; Harrison et al., 2008). Children are provided with texts they can read without difficulty in addition to instructionally challenging leveled texts (Allington, 2006). Easier texts provide fluency practice and an opportunity for students to build their confidence and more difficult texts give readers a chance to acquire higher-level reading skills (Allington 2006; Fountas & Pinnell, 2013; Harrison et al., 2008).
A key component of LLI is that it provides a predictable scope and sequence, as every lesson is similarly organized. Getting children’s minds ready for reading is a strategic way of setting them up for success (Calkins & Tolan, 2010). When children have some sort of expectation about the text they will be reading, they are more likely to figure out unfamiliar words as they navigate through books. LLI lessons (Fountas & Pinnell, 2013) require readers to warm up with a previously read text before beginning a new lesson that encompasses various fluency and comprehension strategies. While rereading, children are encouraged to carefully look at the illustrations, taking notice of clues that assist in decoding difficult print.

Successful teaching for fluency means that educators need to be purposeful in their selection of materials (Allington, 2006). Appropriate reading level texts are chosen and used for different purposes depending on individual reading needs. Many of the LLI texts include memorable language, repeated phrases, poetry and rhyme, natural language patterns, and text at appropriate levels of difficulty (Fountas & Pinnell, 2000, 2013). Harrison et al. (2008) stated, “LLI lessons are designed to be fast-paced, with a specified set of literacy activities for each day of intervention” (p. 4). In order to monitor student progress, Fountas and Pinnell (2013) designed LLI to provide teachers with a framework that would assist in informing their instructional practices. This information collected through implementation of LLI also helps determine whether students require additional intensive Tier 2 and/or Tier 3 small-group RtI instruction.
Response-to-Intervention (RtI)

As mentioned in chapter one, RtI is an early intervention model that begins with an intensive effort to provide high-quality instruction for all students (Allington, 2009; Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2001, 2005; Howard, 2009; Owocki, 2010; Wanzek & Vaughn, 2008). In order to ensure effective reading instruction, students’ progress is monitored according to a 3-Tier model. A multi-tiered problem solving team focuses on delivering differentiated instruction based on students’ needs (Allington, 2009; Howard, 2009; Owocki, 2010).

Tier 1 is instruction for every student in a general education setting, receiving core curricular instruction (TCRWP, 2012). Tier 2 instruction is for students who, according to screening measures, do not respond to general interventions and are not making satisfactory progress in Tier 1 (Howard, 2009). Tier 2 instruction is temporary; however it may be implemented in several rounds by teachers and trained interventionists. Researchers determined that identifying and working with Tier 2 students early in the elementary years will assist in improving their literacy skills (Allington, 2009; Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2001, 2005; Gersten et al., 2009; Howard, 2009; Owocki, 2010; TCRWP, 2012; Wanzek & Vaughn, 2008).

Foundations of RtI

Although the RtI framework is a relatively new initiative (TCRWP, 2012), schools across the United States have been working towards this model for years. According to the United States Department of Education (2010), “The U.S. Congress enacted the Education for All Handicapped Children Act, Public Law (P.L.) 94 142, in
1975” (p. 6). The TCRWP (2012) acknowledged that this historic legislation required school districts to actively identify and deliver children with school-related disabilities high-intensity intervention programs. Identifying students who performed academically below grade level was a step in the right direction; however, children did not always receive the appropriate instructional interventions to meet their individual needs. The TCRWP (2012) claimed that as individual states interpreted the new law:

Most adopted some version of an IQ-achievement discrepancy approach to diagnose learning disabilities. However, there were many limitations to using such a measure, including the fact that using a discrepancy between IQ and achievement test scores to identify learning disabled (LD) students provides no useful information about what academic treatments or interventions might benefit a student. (p. 10)

Years later, the IRIS Center (2007) stated, “Many causes for concern exist regarding schools’ use of the IQ-achievement discrepancy model as the method for identifying students with LDs” (p. 1). That is, because the IQ achievement assessment results did not zero in on students’ specific weaknesses, the assessment was not helpful in informing core instruction. The discrepancy model did not allow schools to identify students in the early grades even though many young children struggle with reading years prior to being identified as LD (IRIS Center, 2007). Even after students were identified, a plan of how to immediately intervene was not put in place. Students were not receiving small-group and individualized interventions in order to keep them from falling further behind their grade level peers. Bradley, Danielson, and Doolittle (2007) claimed, “One
reason RtI was a welcome alternative to the traditional discrepancy approach is that teachers no longer would have to wait for students to fail before the students could receive services” (p. 8).

Prior to Congress reauthorizing the definition of the Individuals with Disabilities Education Improvement Act (IDEIA) (U.S. Department of Education, 2004), President George W. Bush’s Commission on Excellence in Special Education (2002) recommended that RtI be put into place so students would be identified with learning disabilities based on intervention progress. When IDEIA was reauthorized, it allowed school districts to choose identification models such as RtI that represented different inclusionary conditions (Dunn, 2010; Fletcher, 2011; Fletcher & Vaughn, 2009; TCRWP, 2012; U.S. Department of Education, 2004). Fletcher (2011) insisted that RtI is not intended to be used as an assessment for identifying students with LDs; rather, it is an early intervention model.

IDEIA (U.S. Department of Education, 2004) required that if a child is believed to have a LD, he/she receive a comprehensive evaluation that combines different sets of criteria. According to Bradley et al. (2007), “The criterion includes a student demonstrating low achievement, and insufficient response to effective, research-based interventions. Also, exclusion factors should be considered before identification” (p. 798). The U.S. Department of Education (2004) also concluded, “A local education agency may not use more than 15 percent of the amount it receives under IDEA Part B for any fiscal year, to develop and implement coordinated, early intervening services” (p. 2). IDEIA made way for school districts to adopt a preventative model such as RtI in order to start closing academic achievement gaps (Dunn, 2010; Fletcher, 2011; Gersten et al.,
Prior to this preventative model, low-achieving students may have received Title I and/or Reading Recovery intervention services.

**Title I elementary and secondary education act.** The Elementary and Secondary Education Act Title I was signed into law in 1965. The United States Department of Health, Education, and Welfare (U.S. Department of Education, 1969) concluded the purpose of this law was, “To provide financial assistance to local educational agencies serving areas with concentrations of educationally disadvantaged children from low income families” (p. 1). For the first time in history, there was federal aid for the nation’s elementary and secondary schools, based primarily on the number of low-income children ages five to 17 (Podesta et al., 2008).

Title I was put into place in order to help meet the needs of educationally deprived children. The Institute of Education Sciences (IES, 2013) reported, “In school year 2009-10, more than 56,000 public schools across the country used Title I funds to provide additional academic support and learning opportunities to help low-achieving children master challenging curricula and meet state standards in core academic subjects” (p. 1). The United States recognized that educationally disadvantaged children were at-risk for academic failure. Current high stakes testing as well as rigorous curricula require children to perform academically at grade level. IES (2013) concluded, “Title I is designed to help students served by the program meet challenging state academic content and student academic achievement standards” (p. 1).

**Reading recovery intervention.** In the 1970’s, Marie Clay developed a remedial reading program known as Reading Recovery (RR). RR represented a shift in how
teachers viewed the reading process (Clay, 1993, 2002). Clay (2002) determined that lack of early intervention was one reason why many readers continued to fall behind their grade level peers. For years, students were not identified as having learning difficulties until third or fourth grade, making it very hard for them to overcome reading challenges. The RR research project began when teachers started voicing concerns about not being able to modify the avenues of progress for specific students (Reading Recovery Council, 2013). Clay (1993) posed the question, “What is possible when we change the design and delivery of traditional education for children that teachers find hard to teach?” (p. 97). The Reading Recovery Council (2013) reported that Clay attempted to redesign early identification of and instruction for these students. Clay’s design field trials were conducted in five schools in 1978 and repeated again the following year in forty-eight Auckland schools. In 1983 RR was adopted as a national education program throughout New Zealand (Reading Recovery Council, 2013). Since then, RR has been implemented in the many other countries around the world.

Prior to identification of students for RR, first grade and kindergarten teachers consulted with each other regarding the students’ early weeks of first grade. If teacher observations indicated that specific children required additional reading intervention, parent consent was obtained and students began participating in the RR program (Clay, 2000; Dunn, 2010). RR contained a series of 30-minute lessons and strategies for a first-grade student to complete with a trained teacher (Clay, 2005). The program encompassed three intervention phases per year referred to as ‘rounds’ consisting of 12 to 20 weeks of intervention (Dunn, 2010). Students’ progress was reviewed at the end of
each participation period when teachers determined whether a child was successful or if the child required additional RR sessions (Clay, 2005). Clay (1993) determined that even when students performed well in RR, “Some of them remain at-risk children” (p. 59). Although teachers and interventionists did their best to provide individualized and small-group instruction, some students required these services for long periods of time.

After evaluating the RR program, the Institute of Education Sciences (IES, 2007) listed RR as a research-based literacy program. RR is still used as an intervention program that promotes students’ literacy skills progress (Dunn 2010). It can be considered one component within a problem-solving RtI framework.

**Effective RtI Instruction**

Gersten et al. (2009) determined, “Response-to-Intervention is a comprehensive early detection and prevention strategy that identifies struggling students and assists them before they fall behind. RtI systems combine universal screening and high quality instruction for all students with interventions targeted at struggling students” (p. 4). In order to effectively meet the needs of these students, educators must collaborate to make thoughtful and purposeful decisions regarding available resources and implementation. RtI proponents (Cummings et al., 2008; Fletcher et al., 2004; Fuchs & Fuchs, 2001, 2005; Pikulski, 2011; TCRWP, 2012; Vaughn et al., 2009; Wanzek & Vaughn, 2008) insist interventions implemented for the purpose of RtI must be considered research-based. Horner et al. determined that, “Single-subject research is a rigorous, scientific methodology used to define principles of behavior and establish evidence-based practices” (p. 165). Teachers and interventionists utilizing RtI are required to implement
evidence-based instructional strategies and methodologies that have been shown through one or more valid research studies to help students improve academic skills (Dunn, 2010; Foorman & Torgeson, 2001; TCRWP, 2012). Data is collected on a regular basis to determine which instructional strategies are most effective.

**On-going data collection.** Data should be consistently collected by teachers and other professionals as evidence to make instructional decisions (Allington, 2009; Calkins & Tolan, 2010; Fletcher & Vaughn, 2009, Fountas & Pinnell, 2013; Fuchs & Fuchs, 2001, 2007; Gersten et al., 2009, Owocki, 2010; TCRWP, 2012), and if necessary support a referral for special education services. Educators must show that a child has been provided explicit instruction in the general education classroom and that repeated assessments were administered over time (Gersten et al., 2009; TCRWP, 2012).

Another recommendation for educators is to establish a clear vision for school-wide data use (Fountas & Pinnell, 2013; Gersten et al., 2009; TCRWP, 2012). The NAESP (2013) stated, “To help all students achieve, teachers need to systematically and routinely use data to guide instructional decisions and meet students’ learning needs” (p. 3). District leadership teams, building leadership teams and teacher-based teams can assist with this process (Gersten et al., 2009; ODE, 2012). Universally screening and progress monitoring students on a regular basis allows teachers to make instructional decisions based on each child’s needs. Additionally the NAESP (2013) claimed, “Data use is an ongoing cycle of collecting multiple data sources, interpreting data to formulate hypotheses about strategies to raise student achievement and implementing instructional changes to test hypotheses” (p. 3).
The Northwest Evaluation Association’s (NWEA, 2013) Measures of Academic Progress (MAP) and AIMSweb are both examples of assessment systems that generate online reports. Teachers and interventionists have the ability to review data results almost immediately and can access them over long periods of time. Another way school districts can keep track of data is through a web-based assessment management system called Data Director (Houghton Mifflin Harcourt, 2013). The program is fairly simple to navigate and provides access to a variety of collected data for the purposes of progress monitoring and evaluating student achievement. A district-wide data system requires staff to manage and oversee the district’s commitment to maintaining a reliable system. Ongoing data collection is a key component to determining which students require early reading intervention services.

**Early-reading intervention.** Reading intervention research (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Torgesen et al., 1999; Vellutino et al., 1996), revealed that if students identified with reading difficulties are exposed to high-intensity, small group instruction early on, they are able to make significant reading gains. RtI is not an alternative approach for identifying students with learning disabilities; however it is intended to identify students who are at academic risk so that appropriate interventions may be implemented (Foorman et al., 1998; Torgesen et al., 1999; Vellutino et al., 1996) by classroom teachers and interventionists. Should these interventions prove to be successful, students who were deemed at-risk should begin reading grade level text. Eventually they may begin performing at the same academic level as their classroom
Interventions should be individualized in order to meet the needs of each student (Fuchs & Fuchs, 2001; Howard, 2009; Owocki, 2010). Explicit Tier 2 instruction may be delivered in or out of the classroom. Identifying and working with students targeted for Tier 2 intervention is intended to help them improve their skills in specific areas, working towards grade level achievement. Studies have documented substantial gains in fluency and comprehension for students with reading difficulties after receiving early intervention services (Fuchs, Fuchs, Mathes, & Simmons, 1997; Hasbrouck, Ihnot, & Rogers, 1999; Pressley & Wharton-McDonald, 1997). In regards to choosing effective instructional strategies, Owocki (2010) stated, “When it’s at its best, your assessment informs the details and structures of your instruction—and it happens in a continuing cycle. You gather data. You analyze the data to identify your students’ strengths and needs” (p. 1).

RtI avoids letting students performing academically below grade level, who do not qualify for special education services, fall through the cracks in their early elementary years. Fletcher et al. (2004) argued the most significant advantage to using RtI as one factor in the identification of students with reading difficulties is the focus on providing effective instruction. Murawski and Hughes (2009) explained the RtI model as a way teachers can identify students with learning difficulties while supporting students who are struggling academically in the classroom. Researchers (Stecker, 2007; Vaughn & Roberts, 2007) theorize that students may float in and out of Tier 1, Tier 2, and Tier 3 depending on their reading progress. Receiving high quality, explicit instruction should
positively impact students’ reading weaknesses. If students demonstrate a lot of growth, this leads to a reduction of intensity and needs as instructional support increases.

**High-quality instruction.** In order to improve student literacy and close the literacy gap, educators must improve their quality of teaching (Haskins et al., 2012; NRP, 2000). Haskins et al. (2012) stated “Similarly, teacher inservice education will need to become much stronger than the current, most ineffective professional development programs” (p. 3). School districts that begin implementing the RtI model without a real understanding of how to implement Tier 2 and without appropriate instructional materials and training may not find this model to be successful. Collaboration amongst staff members is an essential component to successfully universally screen and monitor students’ progress. Effective training opportunities must also be made available to teachers in order to provide them with the tools and support they need (NRP, 2000). Professional development is required to train educators and other professionals how to effectively provide Tier 2 interventions (Fountas & Pinnell, 2013). When thinking about possible interventions for Tier 2, it is important to utilize as many resources as possible. Teaching assistance and collaboration among interventionists is necessary to support implementing an effective Tier 2 intervention. Implementation also requires general education and special education teachers to work closely when making instructional decisions based on progress monitoring data (Chamberlain, 2006).

With the right models, training (Gersten et al., 2009; Gersten & Dimino, 2006), and materials, school districts may be able to move in the direction of implementing
successful RtI programs. A wide array of stakeholders need to pool resources (Murawski & Hughes, 2009; NRP, 2000) in order for the interventions put in place to be successful.

**Implications for Educators**

To successfully implement the RtI model, teachers, interventionists, special educators, administrators and parents need to commit to gaining an understanding of implementation of a multi-tiered system. Cummings et al. (2008) claimed that emphasis on collaboration between all school professionals and a commitment to effective strategies that support students’ learning needs are key elements to implementing RtI. Appropriate assessments must be chosen and the screening process should be efficient and effective. Based on universal screening information, teachers implement strategies and track student progress for specified amounts of time (Cummings et al., 2008; Dunn, 2010; TCRWP, 2012). An instructional focus should be chosen based on screening and progress monitoring results. It is the educator’s responsibility to assess a child’s strengths and weaknesses and then decide how to intervene.

Instead of the focus being placed on a child’s eligibility for identification of a LD, educators’ concerns start with providing effective instruction (Gersten et al., 2009; Murawski & Hughes, 2009; NRP, 2000). The RtI model is designed so that teachers are able to intervene early in the school year, after universal screening takes place (Dunn, 2010; Fuchs & Fuchs, 2007; Murawski & Hughes, 2009; Owocki 2010). Once a child’s areas of weakness are determined, the classroom teacher focuses instruction on improving those specific reading needs right away.
There are several recommendations to be made for using student achievement data to support instructional decision making. Clay (2002) recommended that in addition to using outcome tests and ability scores to make predictions regarding student growth and achievement, teachers develop a hypothesis about a child that they are willing to revise. Teachers must make data collection part of an on-going cycle of instructional improvement (Bradley et al., 2007; Cummings et al., 2008; Fuchs & Fuchs, 2001; Gersten et al., 2009; Owocki, 2010). The process of using data to improve instruction can be thought of as cyclical. Choosing methods for universal screening and progress monitoring is part of this process. Collecting data from a variety of sources include but are not limited to state standardized assessments, district and school assessments, observation surveys, running records, various curriculum-based measurements (CBM), chapter tests, and classroom projects (Clay, 2002; Owocki, 2010). There are advantages and disadvantages to each type of assessment. No one assessment is going to accurately portray a whole child. Each individual assessment administered by teachers should have a specific purpose, collecting data on particular skills or concepts.

Once data are collected, educators interpret the results and make decisions as to how they can go about improving student learning. Gersten et al. (2009) recommended that teachers test their hypotheses by modifying their instructional practices. In order to best meet the needs of learners, teachers hold frequent meetings to collectively review data in order to make informed instructional decisions. Setting classroom and school-wide goals that clearly state the types of data teachers should be collecting can assist with preparation (Gersten et al., 2009; Murawski & Hughes, 2009). These data need to be
analyzed so teachers can decide which intervention methods should be chosen depending on individual student needs. In addition to teachers and stakeholders analyzing the data, parents are provided with information regarding the multi-tiered system.

**Implications for Parents**

The United States Department of Education (2004) stated, “Three decades of research provide convincing evidence that parents are an important influence in helping their children achieve high academic standards” (p. 1). Students benefit when principals, teachers, and interventionists encourage parent involvement in children’s education. Children achieve at higher levels when schools communicate and collaborate with parents to make decisions regarding intervention needs (U.S. Department of Education, 2004).

Klotz and Canter (2007) concluded that informing parents about the RtI process mitigates concerns they may have. The TCRWP (2012) recommended school principals send letters home to parents explaining the RtI framework. A written letter stating why students were chosen for Tier 2 or Tier 3 services, how often children will receive services, and how their progress will be monitored is the start to building a positive home-school connection. When parents learn about the process, they are taking the first step to becoming active, involved partners in the various phases of RtI (Klotz & Canter, 2007). It is essential for parents to understand their role and how important it is in the RtI process (Fountas & Pinnell, 2013; TCRWP, 2012).

The Federal Government requires Title I to involve parents in the decision making process (U.S. Department of Education, 2004). If compliance with federal regulations
regarding parent involvement is required for Title I, it only makes sense to continue down this path for RtI programs, and eventually merge the two. Schools are required to communicate with parents in an understandable and uniform format (U.S. Department of Education, 2004). Parent involvement is vital to achieving maximum educational growth (U.S. Department of Education, 2004) for students participating in programs such as Title I and RtI. For example, parents are required to sign a parent-school compact with Title I which can be discussed during parent teacher conferences. The TCRWP (2012) designed a similar document stating goals and responsibilities of parents and schools to achieve a quality education for students receiving RtI instruction. Additionally, Fountas and Pinnell (2013) provide specific LLI book sets for the purpose of at-home reading reinforcement.

**LLI component.** Parents are more responsive and apt to be involved in doing their part at home if they are included in the Tier 2 process (Fountas & Pinnell, 2013; Murawski & Hughes, 2009; TCRWP, 2012). In order to create a home-school connection, interventionists send home leveled books pertaining to daily LLI lessons (Fountas & Pinnell, 2013). LLI kits contain communication tools for the purpose of keeping parents informed regarding readers’ progress. These tools include information about what children are learning in each session as well as how the parents can reiterate practicing specific reading skills at home (Fountas & Pinnell, 2013). Parents should not be made to feel as though they are the last ones to know how the process works. Families that are most responsible at home are those that are made to feel that their involvement is important. Keeping parents up to date with the RtI model opens up potential options to
have them become part of the solution. It is recommended that parents be as involved as possible regarding implementation of these policies into practice (Allington, 2009; Fountas & Pinnell, 2013). Reading with their children at home will add to the amount of time students receive explicit instruction at school.

**Implications for Students**

Tier 2 RtI does not replace students’ daily time allotted for reading (Allington, 2009). Teachers should make sure all children are in the classroom for scheduled reading time so as to provide as much modeling, scaffolding, and explicit instruction as possible before small-group and individual Tier 2 interventions take place. Allington (2009) concluded that if struggling readers are taken out of the classroom for intervention during their regular reading block time, intervention will add no additional reading lesson time to their school day. He urged teachers to keep students with reading difficulties in the classroom during their regular reading block in addition to receiving reading instruction during intervention.

Implementing a supplementary, diagnostic instructional trial of best practice means the Tier 1 non-responder participates in small-group instruction with students who share similar instructional strengths and areas of weakness (Fuchs, 2001; Gersten et al., 2009; TCRWP, 2012). Many schools implement Tier 2 sessions at least three times per week for 30 minutes, while other schools set aside time every day (Allington, 2009). Researchers (Fuchs, 2001; TCRWP, 2012) suggested that anywhere from an eight to 12 week Tier 2 supplementary, diagnostic trial be monitored to identify the subset of students who respond inadequately. This allows teachers and interventionists a
substantial amount of time to effectively implement a Tier 2 trial of individualized intervention.

According to the NAESP (2013) educators should, “Teach students to examine their own data and set learning goals” (p. 3). Hamilton et al. (2009) added, “This data analysis process can motivate both elementary and secondary students by mapping out accomplishments that are attainable, revealing actual achievement gains and providing students with a sense of control over their own outcomes” (p. 19). If educators allow students to self-monitor, set their own goals (Hom & Murphy, 1983), and help make informed decisions, students’ interest in succeeding may increase. Students’ analysis of their own assessment data combined with CBM interventions and feedback from their teachers can lead to significant gains in student achievement (Gersten et al., 2009).

The Role of Assessment in RtI

Howard (2009) explained that in order to understand RtI assessment, teachers must distinguish between summative and formative assessment. She determined that standardized tests reflect summative assessments, while ongoing classroom data reflects formative assessment. Summative can be described as assessments of students, while formative is assessment for students (Edwards, Turner, & Mokhtari, 2008; Stiggins, 2002). While summative assessments measure learning, the purpose of formative assessment is to improve learning. Oftentimes summative assessment focuses on a grade or score while formative assessment focuses on feedback (Howard, 2009; Owocki, 2010). Formative assessment requires that teachers observe and interact with children as they read and respond to text (Owocki, 2010). Fuchs (1986) reported, “The use of this...
Formative evaluation strategy to evaluate the effectiveness of interventions for individual students has a positive effect on reading achievement” (p. 201). Formative assessments are typically brief, informal assessments collected by the teacher for the purpose of informing instruction and providing students with feedback (Kaminski & Cummings, 2008; Owocki, 2010). When the progress of all students is systematically monitored, educators are able to determine appropriate instructional intervention needs (Gersten et al., 2009).

**Universal screening.** Universal screening assessments are important components of RtI (Fountas & Pinnell, 2013; Fuchs & Fuchs, 2001; Gersten et al., 2009; Howard, 2009; Owocki, 2010) because their key feature is to accurately identify students as at-risk or not at-risk for performing academically below grade level (Jenkins et al., 2007). These assessments identify students whose reading achievement is significantly below what is expected for their grade level (Owocki, 2010). Universal screeners can provide useful information for important instructional decisions (Howard, 2009), and determine who might benefit from supplemental instruction (Owocki, 2010). Students are generally screened three times per school year (Howard, 2009), but screening may also occur as often as monthly. Many different forms of screening assessments are deemed acceptable to identify students at-risk for failure.

**Types of universal screeners.** Universal screenings occur less frequently than progress monitoring assessments. Screenings evaluate the effectiveness of instructional programs and student mastery of concepts (Howard, 2009; Owocki, 2010). Examples of current universal screening tools include Dynamic Indicators of Basic Early Literacy
Skills (DIBELS) Next (University of Oregon CTL, 2013), the Benchmark Assessment System (BAS) (Fountas & Pinnell, 2008), the Developmental Reading Assessment 2nd Edition (DRA2) (Pearson, 2013), reading inventories (Clay, 2002) and state reading tests.

The Michigan Educational Assessment Program (MEAP) test is a state standardized assessment administered to all students in third through sixth grades once per academic year (Michigan Department of Education [MDE], 2013). A standardized assessment such as the MEAP addresses whether a student has mastered specific grade level skills (MDE, 2013). State standardized test scores resulting from the MEAP can be used to measure overall student growth.

According to the Northwest Evaluation Association [NWEA] (2014), “Measures of Academic Progress (MAP) is a norm-referenced measures of student growth over time. MAP assessments are nationally-normed, by tracking student progress throughout a year and across school years” (p. 1). It was reported that each computerized MAP test takes students approximately one hour to complete and results are available immediately following the test. School districts can decide which measures will work best across grade levels and subject areas. It is important for schools to remain consistent throughout the process in order to see positive results (NWEA, 2013). Students are progress monitored on a regular basis to systematically observe the need for further research-based instruction and/or intervention.

**Progress monitoring.** Educators are expected to administer assessments to monitor students’ reading progress. Research has determined the need for educators to utilize measurement systems that provide accurate data regarding the reading gains made
by students (Crawford, Tindal, & Stieber, 2001). Allington (2009) recommended the use of either Running Records or correct WPM techniques because both provide CBM information regarding reading accuracy, achievement, and fluency. Allington (2009) also stressed the importance of using CBM comprehension techniques such as retelling, summarizing, discussing, or answering questions after silent reading to evaluate reading comprehension.

Fuchs, Deno, and Mirkin (1984) indicated that progress monitoring makes it possible for the teachers to make effective instructional decisions based on students’ reading needs. It allows educators to immediately determine which students require intense instructional support. It also gives students immediate teacher feedback in a reliable fashion. Additionally, teachers are able to use progress monitoring data when identifying students for the purpose of receiving Tier 2 or Tier 3 services, in order to continue their instructional support (Vaughn, Linan-Thompson, & Hickman, 2003).

Progress monitoring within a RtI framework involves collecting repeated measures of performance (Fletcher & Vaughn, 2009, Fuchs et al., 1984). According to Owocki (2010), this required teachers to, “Estimate rates of improvement, identify students who are not demonstrating adequate progress, and/or compare the efficacy of different forms of instruction to design more effective, individualized instruction” (p. 7). Progress monitoring assessments are administered to students receiving interventions anywhere from weekly to monthly, and are the best way to assess whether students’ retain the material they are learning (Gersten et al., 2009). By continuously assessing the progress of individual students using CBM, educators can evaluate the effectiveness of
their intervention within weeks, instead of waiting until the end of the year (or even the following year) to determine if their interventions are working (Deno, 1986). This is a benefit of using CBM in a RtI school setting.

**DIBELS formative assessment.** DIBELS Next (Good & Kaminski, 2013) is quick and minimal training is needed to administer the assessments. As part of the formative assessment process, DIBELS are a set of general outcome measures (GOM) used to evaluate the effectiveness of specific instructional interventions (Kaminski & Cummings, 2008). Fuchs and Fuchs (1986) reported that the use of DIBELS as a formative evaluation strategy to evaluate the effectiveness of interventions for individual students has a positive effect on reading achievement. Shinn (1998) stated, “DIBELS were developed to make educational decisions in a problem-solving model regarding which children require early literacy skills interventions beyond the general curriculum” (p. 116).

DIBELS can determine which interventions are effective on a case-by-case basis, as well as when interventions have successfully reduced the risk of failure (Good & Kaminski, 2013). Development of the DIBELS measures followed a review of the literature on the importance of different early literacy skills. The criteria used to develop and evaluate the DIBELS measures in a problem-solving model were drawn from the criteria used for CBM measures (Kaminski, Cummings, Powell-Smith, & Good, 2008; Shinn, 1998). According to Kaminski et al. (2008), “With GOMs such as DIBELS, student performance on a common task is sampled over time to assess growth and development towards meaningful long term outcomes. GOMs are deliberately intended
not to be comprehensive” (p. 4). The changing benchmarks allow for teachers to chart students’ progress (Vaughn et al., 2003) on simple measures that are representative for later reading comprehension achievement (Good & Kaminski, 2002).

Although there is some controversy surrounding DIBELS as a one-dimensional form of assessment (Allington, 2006), the DIBELS benchmarks are nationally normed so districts are able to compare themselves to others across the country, rather than just regionally or state-wide. Salzman, Clay, Brown, Rosemary, and Lenhart (2005) claimed that DIBELS correlates highly with a nationally norm-referenced test making it a useful measure of students’ reading achievement. Administration of DIBELS is easy, efficient, and the results prove to be useful. Research on CBM in reading demonstrated a moderate relation between oral reading rate and performance on norm-referenced achievement tests.

**DIBELS oral reading fluency subtest.** Fuchs et al. (2001) determined that the strongest empirical support exists for the DIBELS oral reading fluency (DORF) subtest. They argued there is a rich literature examining the use of an oral reading fluency task as a component of CBM. Although CBM and DORF do not directly measure comprehension, results from multiple studies (Fuchs, Fuchs, & Maxwell, 1988; Fuchs et al., 2001) indicated that oral reading fluency is significantly correlated with comprehension scores.

The DORF subtest provides ongoing student data. Students may also find progress monitoring to be repetitive; however it provides teachers with information they can use to modify instructional practices. Allowing students to analyze their own data
may engage them in the process of progress monitoring. If readers are able to view their progress on a visual display they might attempt to self-regulate reading behaviors.

**Self-regulation Through the Use of Self-monitoring**

Literature reported it is challenging for students with learning difficulties to actively self-regulate their behavior (Harris, 1986b; Mercer, 1991). Self-regulation is an academically relevant construct because historically, individuals’ ability to regulate their own behavior has been viewed as valuable (Mahoney & Thoresen, 1974). Researchers (Boswell, Knight, & Sprigs, 2013; Mace & Kratochwill, 1988; McDougall, Morrison, & Awana, 2012) determined that one way for children to self-regulate is through the process of self-monitoring. They also concluded that self-monitoring demonstrated potential to inspire students to self-regulate their own target behaviors. Self-monitoring occurs when a person systematically observes and records his or her own target behavior (Cooper, Heron, & Heward, 2007). After reviewing previous studies (Boswell et al., 2013; Ballard & Glynn, 1975; Holifield, Goodman, Hazelkorn, & Heflin, 2010; Glynn & Thomas, 1974; Glynn, Thomas, & Shee, 1973; McDougall & Brady, 1988; McDougall et al., 2012; Prater, Joy, Chilman, Temple, & Miller, 1991), the importance of investigating the usefulness of self-monitoring interventions for students with learning difficulties was evident.

Use of self-monitoring interventions encourage students to exercise control of their learning with a goal of improving their academic performance. Marzano et al. (1988) reported that when children are encouraged to develop awareness about their own thinking and learning process, teachers are helping them think about the effectiveness of
the strategies they use in accomplishing their goals. Literature revealed that self-monitoring can be used to help students with and without disabilities improve areas of academic weakness.

Since self-monitoring is often a component of an intervention that includes reinforcement for achieving self-selected goals (Lee, Palmer, & Wehmeyer, 2009; Rhode, Morgan, & Young, 1983), it is a worthwhile strategy to implement for students receiving individualized instruction. If teachers encourage students to reflect on their own progress, allowing them to assist in interpreting their results might make them feel involvement in the process (Boswell et al., 2013). Self-monitoring strategies can help students manage their own behavior (McDougall et al., 2012). Performance in academic areas such as reading and completing assignments accurately may increase through the use of self-monitoring techniques.

**Self-monitoring of performance.** In order for students to successfully self-monitor, the process should be easy and efficient. According to Reid and Harris (1993), “Self-monitoring of performance (SMP), focuses on the results of cognitive involvement (i.e., monitoring of academic responses) with a goal of improving academic performance” (p. 30). Howard (2009) suggested that self-monitoring recording forms be kept simple and manageable so students are able to efficiently track their own progress.

Reid (1996) documented the amount of research regarding self-monitoring with students has steadily increased over the years. After reviewing literature on self-monitoring, specifically with LD students, Reid (1996) found the effects of self-
monitoring on accuracy is less well researched. To accurately interpret results, it is necessary to have information on both rate (number of attempts) and accuracy.

In their study, Dunlap and Dunlap (1989) supported the use of self-monitoring as a way to help students make immediate gains in correctly responding to basic mathematics problems. Their study calculated the effectiveness of a self-monitoring package with LD students whose response to subtraction problems had been very inconsistent and unsuccessful. According to Dunlap and Dunlap (1989), “A consistent finding has been that the use of self-monitoring checklists helps children to respond correctly and consistently” (p. 312). Maag, Reid, and DiGangi’s (1993) study also reported clear effects on accuracy of responding for all participants. Their results supported the hypothesis that self-monitoring different target variables can differentially affect students’ academic productivity, engagement, and/or accuracy (Maag et al., 1993).

Both of these studies support a hypothesis that self-monitoring can have a positive effect on academic performance. Reid (1996) questioned whether awareness alone was sufficient for improving accuracy unless there was a concurrent awareness of, or instruction in, the strategies or skills, however Dunlap and Dunlap’s (1989) study addressed this concern. Their study required students to self-monitor appropriate steps necessary for accurate task performance with dramatic results and it was determined that self-monitoring procedures produced immediate gains in correct responding. Reid (1996) claimed, “The body of evidence supporting the positive effects of self-monitoring on important academic variables such as on-task behaviors and productivity is undeniable by any objective standard” (p. 15). Reid noted that although there is a lack of research into
the effects of self-monitoring, this strategy should still be used to further investigate new learning techniques and improving mastery in academic areas. One technique may include the use of self-graphing strategies to improve academic and behavioral outcomes.

**Self-graphing strategy.** Self-observation and self-recording are strategies that can improve on-task behavior and academic productivity. DiGangi, Maag, and Rutherford’s (1991) study determined that self-monitoring is becoming increasingly important because of its reactivity—the ability to produce changes in the target behavior. Through the use of self-reinforcement and self-evaluation, students are able to monitor their own progress.

DiGangi et al. (1991) studied the effects of two students self-graphing on-task behavior and measures of academic arithmetic performance, specifically productivity and accuracy. A single-case design (SCD) was implemented across a total of six experimental phases. Students were asked to record and plot their number of on-task behaviors, problems answered correctly (accuracy), and problems completed (productivity). Due to self-reinforcement and self-graphing, results determined that academic gains maintained for productivity and increased for accuracy. DiGangi et al. (1991) stated, “Self-graphing appears to be a potentially powerful variable for enhancing reactivity of self-monitoring on both on-task behavior and academic performance” (p. 228). Dunlap and Dunlap (1989) also supported findings from studies focusing on self-monitoring processes that show these techniques can increase accuracy across various academic subject areas.
Dunlap and Dunlap (1989) concluded that self-monitoring can be particularly helpful when utilized by students with learning difficulties, as there are continuous instructional cues that produce specific response strategies. Their multiple baseline across three participants design showed immediate gains for each student once a self-graphing package was introduced. Results indicated that self-monitoring procedures such as self-graphing are applicable in classrooms (Dunlap & Dunlap, 1989). When teachers encourage students to self-regulate their own learning, the responsibility begins to shift to the students.

Gradual release of responsibility. The gradual release of responsibility model is research-based (Pearson & Gallagher, 1983) and can be utilized in a Tier 2 RtI setting. In this model, the responsibility for task completion gradually shifts over time from the teacher to the student (Pearson & Gallagher, 1983). Interventionists initiate and identify objectives for students through modeling, demonstration and thinking aloud (Routman, 2003). Initially teachers model reading behavior and think aloud (showing how). Guided practice or scaffolding gradually gives readers more responsibility for using the strategies being taught (Miller, 2002). When it is time to practice, children independently begin to take more responsibility as they apply the strategies. Application of the strategy takes place when readers independently apply their learning to different types of text or in other areas (Miller, 2002). Children take charge of practicing these skills in an effort to meet their goals. The interventionist’s goal is for readers to initiate integration into their own practice of all the strategies they have learned so eventually a sense of agency sets in (Routman, 2003).
Summary

The process of becoming a fluent reader is challenging for students with reading difficulties. Being able to read text with speed, accuracy, and prosody takes time and practice for less skilled readers. Readers who struggle with fluency have a hard time comprehending what they read. RtI is a multi-tiered early intervention model, designed to provide students reading below grade level with high-intensity instruction. After initial Tier 1 screenings are administered, students may be identified as having reading difficulties and placed in Tier 2. Tier 2 provides students with intensive small-group intervention in order to improve reading weaknesses.

Effective RtI instruction implements evidence-based strategies to help students improve their academic skills. LLI is one example of a small-group, intense intervention program created for students with reading difficulties. Students receiving Tier 2 intervention are progress monitored on a regular basis. One way to involve students in the data collection and evaluation process is through self-monitoring. Self-observation and self-graphing strategies can improve on-task behavior and academic productivity in students with learning difficulties. When students self-regulate their own learning, it can directly impact academic skills.
Chapter 3: Methodology

A single-case design (SCD) was used as the experimental methodology for measuring response to educational interventions. The use of a SCD to monitor students’ reading rate progress is an effective way to measure reading growth, allowing researchers to make evidence-based decisions about the effects of self-graphing (DiGangi et al., 1991; Horner et al., 2005; Ried, 1996). A SCD allows for educational professionals to use a defensible methodology to determine the effectiveness of an intervention strategy (Riley-Tillman & Burns, 2009). Schools across the country are facing pressures, specifically in literacy, to meet state standards and high-stakes testing expectations. According to Horner et al. (2005), “Single-subject research has proven particularly relevant for defining educational practices at the level of the individual learner” (p. 165).

For the purpose of this study, a multiple baseline design replication was used across participants with a lag between phase changes across multiple consequents. The multiple baseline design used the same outcome variable and treatment (self-graphing) with staggered implementation of the treatment across conditions. This design addressed threats to validity because the self-graphing treatment was introduced to participants at staggered points in time and the lag between each A-B design allowed for the potential of experimental control (Best & Kahn, 2003; Riley-Tillman & Burns, 2009). Logically, when self-graphing was implemented in the first A-B condition, a change in the outcome data was expected for only that condition. Extending students’ baseline phases (A phases) for conditions two through four before introducing the treatment acted as verification for the A phase in the first A-B design (Riley-Tillman & Burns, 2009).
This chapter describes the process of conducting the study. Student performances on curriculum-based measurement (CBM) indicators were compared to grade level performance expectations in order to identify children at-risk of reading failure. As stated in chapter one, the purpose of Response-to-Intervention (RtI) is ultimately to support students with learning needs. Since RtI is a framework that allows teachers to intervene early on with non-proficient readers, Tier 2 is meant to accommodate students in need of additional instructional support. A multiple baseline design introduced a self-graphing treatment at staggered points in time throughout leveled literacy intervention (LLI) instructional sessions. This study was designed to determine the impact of self-graphing on Tier 2 students’ oral reading fluency skills. Participant selection procedures are included in the following section.

Selection Procedures

When selecting participants for the design, the following factors were considered: age, grade level, developmental level, universal screening scores and RtI reading needs. Participants were selected based on similarities in each of those areas. First grade attendance reports were reviewed, noting which children qualified for Tier 2 instruction boasted good attendance rates from the previous year. This information was taken into account when selecting the sample. (See Appendix A.) Four second grade students were recruited, and permission from the elementary school principal was granted prior to implementation of the study.

For the purpose of this investigation, the sample included second grade participants who were screened in September 2013, December 2013, and March 2014
with Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Next. The results were analyzed to determine which students qualified for Tier 2 RtI services. In this study DIBELS oral reading fluency (DORF) measures were used as the CBM and were individually administered once per week for 13 weeks. Four students received high-intensity LLI, and were introduced to a self-graphing treatment at staggered points in time. (DORF) subtests were used as the progress monitoring measure in Tier 2 baseline and intervention phases. DORF assessments consisted of students reading aloud single reading passages for one minute. DORF directions and scoring procedures were followed in order to monitor each student’s individual progress. All reading probes were administered individually, according to the standardized procedures. Additionally, SCD data collection standards and analysis procedures were followed.

SCD Design Standards

Including four participants in the design made for an adequate sample size to ensure What Works Clearinghouse (WWC) standards were met (Horner et al., 2005; Kratochwill et al., 2010). The WWC is an initiative of the United States Department of Education’s Institute of Education Sciences (IES).

Kratochwill et al.’s (2010) WWC Technical Documentation states:

In order to provide Strong Evidence, at least two WWC reviewers certified in visual (or graphical) analysis must verify that a causal relation was documented. Specifically this is operationalized as at least three demonstrations of the intervention effect along with no non-effects by:
• Documenting the consistency of level, trend, and variability within each phase
• Documenting the immediacy of the effect, the proportion of overlap, the consistency of the data across phases in order to demonstrate an intervention effect, and comparing the observed and projected patterns of the outcome variable
• Examining external factors and anomalies (e.g., a sudden change of level within a phase). (p. 16)

According to Horner et al. (2005), “Each participant serves as his or her own control. Performance prior to intervention is compared to performance during and/or after intervention” (p. 166). The purpose of the multiple baseline design was to observe at least four performance outcome measures in order to document a causal effect. Each participant received the self-graphing treatment at different stages throughout the investigation. Horner et al. (2005) stated, “Single-subject research designs typically compare the effects of an intervention with performance during a baseline, or comparison condition” (p. 168). A multiple baseline design supported the internal validity of this study because the self-graphing treatment was introduced to participants at staggered points in time.

Kratochwill et al. (2010) stated, “Include at least three attempts to demonstrate an intervention effect at three different points in time or with three different phase repetitions” (p. 15). A trained interventionist delivered LLI instruction to four students four times per week. A multiple baseline design should include at least three baselines
and for the purpose of this study, four students were included to control for unanticipated attrition or excessive absences.

**Setting**

The intended population included second grade students who were enrolled in an elementary school located in Southeast Michigan. The school district is comprised of seven schools, including four kindergarten through fourth grade buildings, one fifth through sixth grade Intermediate School, one seventh through eighth grade Middle School, and one High School.

According to the Michigan Department of Education [MDE] (2013) Annual District Education Report, the school district recently completed its second year of aligning English Language Arts curriculum with the Common Core State Standards. The school district used AIMSweb and DIBELS universal screening assessments, along with Michigan Educational Assessment Program (MEAP) scores and classroom assessments to determine students in need of additional time and support. The district invests in full-time RtI facilitators in grades kindergarten through sixth, who coordinate interventions and maintain data to inform instruction. During the summer of 2013, three of the eight schools were named MDE Reward Schools, meaning they were in the top 5% of schools in the state. One of those elementary schools participated in the current study (MDE, 2013).

**Materials**

**LLI kit.** Four mornings per week Tier 2 students were given a copy of the previous LLI session’s leveled text. Students warmed up by rereading the text before
participating in a word work activity. Students read multiple leveled texts throughout the remainder of the 30 minutes of intervention. Dry erase boards were used for word work practice throughout the 30 minutes of high-intensity intervention.

**iPAd.** For record keeping purposes, the researcher used an audio version, Running Record iPad app. This app included a Running Record calculator and stopwatch recorder. Word count, errors, and self-corrections were calculated electronically. The iPad app was used to monitor students’ DORF subtest progress.

**Graph paper and ruler.** Each student was given a graph to self-record correct words per minute (WPM) progress. The graph displayed data by session on the horizontal axis and correct WPM read on the vertical axis. After the self-graphing treatment was applied, once per week students recorded their correct WPM by using stickers to plot the corresponding data points.

**Journal log.** The researcher kept a journal in order to record participants’ absences, instances of non-response, student reactions to performance, and student reading preferences.

**Experimental Multiple Baseline Design**

Multiple baseline SCDs are replication designs (Best & Kahn, 2003). The current study consisted of a multiple baseline across four participants in second grade. In this investigation each baseline represented correct WPM fluency progress for each child. Tier 2 LLI progress monitoring sessions were placed along the x-axis. Once the self-graphing treatment was introduced, the greater the lag between phase change with no unexpected change in outcome data, the less likely the changes in reading rate were due
to variables external to the study, and the stronger the experimental control (Horner et al., 2005; Kratochwill et al., 2010; Riley-Tillman & Burns, 2007).

The researcher introduced the first self-graphing treatment four weeks after Tier 2 LLI sessions began. Self-graphing correct WPM progress was introduced sequentially on a time-lagged basis, specifically two weeks apart. Extending the second student’s baseline phase until after an intervention effect was demonstrated for the first subject allowed the researcher to control for maturation, history, and any other threats to the internal validity of the study (Best & Kahn, 2003).

**Intervention.** A trained reading interventionist provided LLI instruction in small-group settings. Each student received 52 small group 30-minute LLI sessions within the 13-week time period. The self-graphing treatment was systematically introduced to individual readers, and from that point on they began plotting their correct WPM data points. The self-graphing strategy was implemented once per week for the remainder of the intervention phase. Both the interventionist and researcher followed a graphing protocol (see Appendix B) and assisted students in self-graphing when necessary.

**Variables.** Within this multiple baseline design the case provided its own control for purposes of comparison. Specifically, the students’ series of outcome variables prior to self-graphing were compared with the series of outcome variables during and after implementation of self-graphing (Kratochwill et al., 2010). The dependent variable was the number of correct WPM read as measured by the DORF subtests. The self-graphing of progress in correct WPM read was used as the independent variable.
The current study relied on visual analyses and descriptive statistics in order to assess the effects within this SCD. Level, trend, variability, immediacy of effect, proportion of overlapping data, and consistency of data patterns were analyzed. Level refers to the mean within a phase of the study. Trend references the state of increase or decrease of the best-fitting straight line for number of correct WPM within a phase. Variability refers to the degree to which performance fluctuates around a mean or slope during a phase (Horner et al., 2005; Kratochwill et al., 2010). The immediacy of effects following the onset of self-graphing in addition to the proportion of data points in adjacent places that overlap in level were analyzed. The magnitude of changes correct WPM combined with the consistency of data patterns across multiple presentations of self-graphing conditions were also documented. Horner et al. (2005) stated, “The integration of information from these multiple assessments and comparisons is used to determine if a functional relationship exists between the independent and dependent variables” (p. 171)

Visual analysis was used to determine if the observed data demonstrated at least three indications of an effect at different points in time. Kratochwill et al. (2010) determined, “If this criterion is met, the data are deemed to document a causal relation, and an inference may be made that change in the outcome variable is causally related to manipulation of the independent variable” (p. 19).

Assessment designed to measure fluency. DORF subtests were used as the progress monitoring measure in the current RtI model because they allowed teachers and interventionists to collect data over short periods of time. Rapid measurement is
conducive in a multiple baseline design; specifically, DORF assessments are quick and to the point. DORF subtest administrators receive immediate feedback after students finish reading each passage aloud. In this study, progress monitoring with DORF subtests assessed the impact of the self-graphing treatment on oral reading fluency. DORF results provided the design with a standard measure of progress for all participants. The goals and cut scores are research-based, and provide criterion-referenced scores. DORF subtests provided immediate results, indicating whether a student was making weekly fluency gains (Good & Kaminski, 2008; Salzman et al., 2005).

Running Records of oral reading fluency enabled the DIBELS administrators to analyze student errors. Once the logic of readers’ errors is determined, they can make instructionally-based decisions regarding effective interventions. It is necessary for teachers and interventionists to determine whether an error is categorized as meaning, structure, or visual. Depending on the types of students’ errors and self-corrections, teachers can interpret results and immediately deliver specific instruction based on these errors (Johnston, 2000). Once miscues are interpreted, interventionists are able to adjust their LLI instruction to meet the needs of each individual reader.

**Interpreting errors.** According to the TCRWP (2013), “Meaning cues can come from a variety of sources in the text: the illustration, the story—plot, characterization, theme, flow of story, the mood in that part of the story” (p. 6). Previous experiences with texts or readers’ personal connections can also have an effect on making meaning miscues. Specifically the TCRWP (2013) stated, “If children are using meaning, their substitution is clarified by the meaning cues available in the story and/or those which are
part of their background experience” (p. 6). Additionally the TCRWP (2013) claimed that structure cues, “Are determined by the word order or syntax of the words in a sentence, (i.e., does it make sense to say it that way or does it sound right to say it that way?)” (p. 7). Oftentimes after conducting running records during progress monitoring, the administrator may notice a pattern regarding the types of errors made. Regarding the final type of miscue, the TCRWP (2013) stated, “Visual cues are one source of information readers use to allow themselves to read the author’s text” (p. 8). Throughout the present study, weekly progress monitoring with DORF subtests allowed the researcher and participants to interpret results. Based on the scores, the interventionist adjusted LLI instruction accordingly.

Data Collection Procedures

Data collection within a multiple baseline design should take place concurrently in the same or similar settings (Riley-Tillman & Burns, 2009). Students in this study participated in Tier 2 LLI at the same time of day, four days per week, in their elementary school building. The procedures used in this study were delivered in the morning during building-wide allotted RtI time. The principal was responsible for creating the schedule. First graders were universally screened in May 2013 with AIMSweb and DRA2. These same students were screened again with DIBELS in September 2013, December 2013, and March 2014. Readers who performed below the benchmark for second grade on the most recent screening measure were selected for Tier 2 LLI. Of those, four participated in the investigation for a 13-week time period.
DORF subtest data were collected repeatedly once per week through progress monitoring. This process continued throughout the entire study in order to extend data collection to evaluate trends. The assessment methods were defensible, feasible, and repeatable. DORF subtests measured how many correct WPM each student reads per passage. The data collected was compared to second grade benchmark goals that represented minimum levels of performance for all students to reach in order to be considered on track for becoming grade-level readers (Good & Kaminski, 2008). The self-graphing treatment was introduced to students at staggered points in time.

**Self-graphing treatment.** A multiple baseline design was appropriate for Tier 2 LLI sessions because the self-graphing strategy was implemented sequentially on a time-lagged basis. Students were introduced to the exact same treatment condition, every two weeks during Tier 2 RtI sessions. Previous research suggested that a multiple baseline across participants design is ideal for evaluating the effectiveness of a particular strategy because it involves replicating the finding with multiple participants, with a repeated effect (Riley-Tillman & Burns, 2009). DORF running record results for the targeted students provided baselines against which changes after the self-graphing strategy was introduced could be evaluated.

DORF passages are adjusted for the goal level of reading for each grade level; therefore students were given second grade reading passages and asked to read aloud for one minute. Errors are words omitted, substitutions, and hesitations of more than three seconds. Participants were provided with an opportunity to see and self-monitor their oral reading fluency progress. They were actively involved in the intervention and
assessment process. Once the self-graphing strategy was introduced, readers observed their correct WPM progress over an extended period of time. The self-graphing treatment gave students an opportunity to visually recognize any changes over time. By introducing self-graphing, students were motivated to improve their reading skills. It was possible for the researcher to record whether each child’s oral reading rate increased after the self-graphing treatment was put in place. This design assisted in gathering evidence-based research to help implement future Tier 2 reading practice.

The multiple baseline sampling plan supported the researcher’s ability to draw conclusions as to whether students’ self-graphing had an effect on correct WPM read. During LLI instructional sessions, students were asked to read aloud, read independently, and/or read with a peer for short periods of time. Once per week students individually plotted data points documenting their correct WPM read using graph paper, stickers, and markers. As the 13-week time period progressed, readers observed whether their reading rates increased, decreased, or stayed the same. The researcher analyzed data to observe trends.

Inter-observer agreement. Inter-assessment agreement conditions were set between the researcher and interventionist prior to the beginning of the study. Kratochwill et al. (2010) recommended an 80% agreement rate. Kratochwill et al. (2010) required, “Each outcome variable must be measured systematically over time by more than one assessor and the study needs to collect inter-assessment agreement in each phase and on at least twenty percent of the data points in each condition” (p. 15). The participating interventionist and researcher practiced collecting DORF subtest data at the
same time in the same setting, and afterwards compared results and analyzed 100% match. They followed a specific protocol for administering DORF subtests and the self-graphing treatment. It was important that each assessor was held accountable to the agreement made to ensure accuracy in data collection and interpretation.

**DIBELS Procedural Reliability**

CBMs of oral reading fluency have been extensively researched. They have been found to have good reliability and validity (Marston, 1989). Good and Kaminski (2008) claimed that the concept of DIBELS as *indicators* is a critical one. It is this feature of DIBELS that classifies it as a general outcome measure (GOM) assessment. DIBELS assessments are easy to administer and the changing benchmarks allow teachers to chart students’ progress over time (Salzman et al., 2005).

**Internal validity.** SCD causal research explores the effect of one variable on another. When working with a multiple baseline design, researchers expect a change in only the outcome data of the second A-B condition. Both the first A-B condition (currently in a B-phase) and the third (currently in an A phase) should remain stable. If this pattern is not followed for each of the A-B conditions, internal validity is threatened (Riley-Tillman & Burns, 2009). There are many common threats to internal validity that researchers must account for when working with SCDs. Design principals and visual analyses can combine to address these threats. As previously mentioned, Kratochwill et al. (2010) determined that in order to provide *Strong Evidence* for a causal claim, a design should incorporate three demonstrations of an effect. This is important because in an A-B design, practitioners cannot make a strong causal claim for an effect if the
intervention is only introduced once. There are too many potential threats to internal validity without reapplication of the treatment. Multiple baseline designs address threats to validity because treatments are introduced to participants at staggered points in time.

Staggered implementation of self-graphing is important because the lag between each A-B design allows for the potential of experimental control (Riley-Tillman & Burns, 2009). When the intervention was implemented in the first A-B condition, the researcher expected a change in the outcome data for only that condition. By extending baseline phases (A phases) for conditions two, three, and four before introducing the treatment in a multiple baseline design, it acted as verification for the A phase in the first A-B design. The researcher oversaw implementation of the staggered self-graphing treatment.

Once the treatment conditions began, the researcher was aware of any external variables impacting the first A-B condition at the same time the treatment was applied. This was done by observing a change in the outcome data in the second case. The level of correct WPM within each phase was documented for visual analysis purposes (Riley-Tillman & Burns, 2007). The data was examined within a phase in order to describe participants’ patterns of performance and to observe their expected performance, assuming the independent variable was unchanged.

**Visual analyses.** SCDs rely heavily on the use of visual inference (Horner et al., 2005). The researcher kept in mind four basic questions during visual analysis concerning the effectiveness of educational interventions. Are the data observed reliable? Was the reading behavior being observed altered when the self-graphing strategy was applied? If the process were altered, was there an important or meaningful change? Are
the results generalizable to other students; that is, could this treatment work with other Tier 2 second graders receiving LLI instruction (Furlong & Wampold, 1981)?

Furlong and Wampold (1981) stated, “The reliability of the data is determined by answering the question: ‘Is the range of the observed data points on the graph stable?’ This question is evaluated within each phase and between similar phases of the single-subject design” (p. 81). The variation of scores decreased from baseline phase to intervention phase in three out of four cases. Consistent patterns of low variability allowed the researcher to determine that no extraneous variables affected the measurement of students’ reading performances. Using visual analysis, it was observed that the effects were immediate once the treatment was introduced. The outcome data concluded that students’ self-graphing improved oral reading rate. This self-graphing treatment can be considered a tool to help to other second graders receiving Tier 2 explicit instruction.

**Summary**

SCDs allow for education professionals to determine the effectiveness of an intervention strategy, especially when choosing particular approaches at the level of individual students. A multiple baseline design treatment effect is demonstrated by having more than one baseline with the treatment introduced at staggered points in time. In the current study, each baseline represented a different Tier 2 second grade participant.

A reading interventionist delivered 30 minutes of Tier 2 LLI instruction four times per week. Students were progress monitored on a weekly basis with DORF subtests. Correct WPM was documented and students were introduced to a self-graphing
treatment at staggered points in time. After self-graphing was applied, they recorded
correct WPM data points on a graphic display. The researcher relied on visual inference
to observe treatment effects.
Chapter 4: Results

This chapter reports descriptive statistics and visual analyses regarding the single case design (SCD) experimental methodology for measuring student responses to a self-graphing treatment. The researcher examined the effects of self-graphing on Tier 2 second graders’ reading rates, as measured by Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Next oral reading fluency (DORF) subtests. The current study also investigated how second graders receiving Tier 2 Response-to-Intervention (RtI) compared with each other in performance on progress monitoring and self-graphing correct words per minute (WPM). For the purpose of this investigation a multiple baseline design replication was accomplished across four child participants with a lag between phase changes across multiple consequents. Staggered implementation of the self-graphing treatment across conditions allowed for experimental control. Baseline phases (A phases) were extended for conditions two through four before introducing the self-graphing treatment. Extending these phases acted as verification for the A phase in the first student’s A-B design.

Organization of Data Analysis

Visual analysis was conducted according to Kratochwill et al. (2010), “Six features are used to examine within- and between-phase data patterns: level, trend, variability, immediacy of effect, overlap, and consistency of data patterns across similar phases” (p. 18). Data was observed within the baseline and intervention conditions, and in comparison to the baseline and intervention conditions. Performance levels consisted of means within each baseline and intervention phase. The researcher studied data from
all phases within the baseline and intervention, and examined the amount of consistency in the data patterns with the same conditions (Kratochwill et al., 2010).

**Baseline and Intervention Procedures**

During baseline and intervention phases, a reading interventionist delivered 30 minutes of Tier 2 small-group instruction four times per week. Each student received high-intensity leveled literacy intervention (LLI) throughout the duration of the investigation. Students were progress monitored with DORF subtests once per week and introduced to the self-graphing treatment at staggered points in time. Staggered implementation of the self-graphing treatment is presented in Figure 1. Figure 1 also displays the A phases for conditions two through four before introduction of the treatment. Extending these phases acted as verification for the A phase in Student 1’s A-B design.
Figure 1. Multiple baseline across participants design demonstrates staggered implementation of self-graphing treatment. Squares represent data points per session. Dashed lines represent introduction of self-graphing treatment.
Inter-observer Agreement

Inter-observer agreement data were collected for 92% of sessions in all cases within and across baseline and intervention phases. In addition to the researcher, a second individual (reading interventionist) collected DORF subtest data. An agreement occurred when both the researcher and interventionist recorded reading responses reaching 100% accuracy according to the scoring manual and script for administering DORF subtests.

The researcher administered six DORF progress monitoring subtests throughout the 13-week study, and the reading interventionist administered seven subtests. The researcher and interventionist adhered to the DORF administration directions, following the script exactly in order to ensure high reliability. During administration, the researcher and reading interventionists followed along and marked the students’ responses in scoring booklets according to the DORF subtest scoring rules. At the end of one minute, each administrator placed a bracket in the text after the last word provided by the student.

In order to ensure high scoring reliability the reading passages were repeated each week, with the exception of the Session 1 DORF benchmark subtest. The researcher repeated administration of each passage one week after the reading interventionist administered the same passage. A running record iPad calculator was also used during progress monitoring sessions to audio record students reading passages aloud.

Data Imputation

Throughout the study, two students were recorded absent on two different progress monitoring occasions. Both students regularly attended Tier 2 RtI sessions so
cause of absence did not seem to be related to the investigation. For the purpose of displaying a complete picture of the data, two units of missing data were imputed. In order to avoid problems for analyzing data, imputation was viewed as a way to default discarding any case that had a missing value (Gelman & Hill, 2006). Imputation required replacing each missing value with the mean of the observed values for correct WPM data points according to DORF subtests. Imputation preserved all cases by replacing missing data with a probable value based on the means of each student’s baseline and intervention phase. A unit value of 56 was imputed for Session 9 of Student 2’s intervention phase. A unit value of 50 was imputed for Session 7 of Student 4’s baseline phase. Both values were determined according to the mean of each phase.

**Assessing Performance Level in Baseline and Intervention Phases**

The amount of the target variable correct WPM changed from baseline to intervention phase in the case of all four students. Table 1 provides information regarding means and standard deviations for all students’ correct WPM data. The mean differences for each baseline to intervention phase are presented in bold type. All four student means increased after the self-graphing treatment was applied.
Table 1

Summary of Means, Standard Deviations for DORF Subtest Results

<table>
<thead>
<tr>
<th>Student</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>43</td>
<td>2.7</td>
</tr>
<tr>
<td>Intervention</td>
<td>52</td>
<td>7.2</td>
</tr>
<tr>
<td>Difference</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Student 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>44</td>
<td>6.4</td>
</tr>
<tr>
<td>Intervention</td>
<td>56</td>
<td>5.2</td>
</tr>
<tr>
<td>Difference</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Student 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
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</tr>
<tr>
<td>Intervention</td>
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<tr>
<td>Difference</td>
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</tr>
<tr>
<td>Student 4</td>
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<td></td>
</tr>
<tr>
<td>Baseline</td>
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</tr>
<tr>
<td>Intervention</td>
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<td>10.0</td>
</tr>
<tr>
<td>Difference</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Note. Means and standard deviations for students’ baseline and intervention phases are presented in vertical columns. The mean difference for each student (n = 4) is presented in bold type.

**Student 1.** Student 1’s baseline phase mean correct WPM was 43 (SD = 2.97). Four data points were collected during baseline, and these observations fell in a relatively stable pattern (See Figure 2). After the self-graphing treatment was introduced, the correct WPM mean increased to 52 (SD = 7.2) across nine data points. An increase in level of performance was recorded almost immediately after the self-graphing treatment was introduced.
Figure 2. Student 1 performance and mean for baseline and intervention phases.

Student 2. Student 2’s performance level increased considerably after the self-graphing treatment was introduced (see Figure 3). The baseline phase mean correct WPM was 44 (SD = 6.4), and after the self-graphing treatment was introduced the mean increased to 56 (SD = 5.2). This student’s baseline phase correct WPM increased from the first data point to the sixth data point. Additionally, once the self-graphing treatment was applied, all correct WPM intervention phase data points remained above the baseline mean.
Student 3. A slight increase in performance level for correct WPM from baseline to intervention phase is displayed in Figure 4. Eight data points were collected during baseline, and fluctuated somewhat dramatically within this phase. Student 3’s lowest number of 25 correct WPM was documented when progress monitored in Session 3. However, she read a personal high number of 63 correct WPM in Session 6. The baseline phase mean was 44 (SD = 13.3) correct WPM. Although there was only a slight increase in the mean to 47 (SD = 3.8) correct WPM within intervention phase, the data points stabilized after self-graphing was introduced. Initially, Student 3’s data points decreased when the treatment was applied in Session 9, and continued to decrease through Session 11. However, her data points increased in Session 12 and Session 13.
**Student 3.**

![Graph showing Student 3's performance and mean for baseline and intervention phases.](image)

*Figure 4.* Student 3 performance and mean for baseline and intervention phases.

**Student 4.** Student 4’s baseline phase mean was 50 (SD = 9.8) correct WPM. Throughout the baseline phase, his correct WPM data points increased. The data points indicated that he responded positively to the LLI instruction received during Tier 2 RtI sessions. The data points from Session 1 through Session 10 demonstrated a steady increase in correct WMP progress. During Session 6, Student 4 read a personal high number of 68 correct WPM. Although this student did not read 68 correct WPM again throughout the investigation, the intervention phase mean increased to 56 (SD = 10.0) correct WPM. Immediately after the self-graphing treatment was applied, his data points decreased, however after the first intervention phase session, his data points increased.
Assessing Trend in Baseline and Intervention Phases

Trend is determined by the slope of the best-fitting straight line within baseline and intervention phases. Observed and projected patterns of the outcome variable were compared in the case of each student. The slope of the line measures how much the value of $y$ (correct WPM) changed for every unit that the value of $x$ (sessions) changed; that is, for one additional session (i.e., one unit increase in $x$) there was a corresponding change to the correct WPM (i.e., change in $y$). In the cases of Student 1 and Student 2, both demonstrated slightly negative slopes within their intervention phases. Both were students who spent the least amount of time in baseline. Student 3 and Student 4 each demonstrated positive slopes within their baseline and intervention phases.

Figure 5. Student 4 performance and mean for baseline and intervention phases.
**Student 1.** As seen in Figure 6, Student 1’s data points displayed a negative slope \((m = -0.6)\) within the first four weeks of baseline phase (see Figure 6). After implementation of the self-graphing treatment, the intervention phase mean of correct WPM increased, however a slightly negative slope \((m = -0.0833)\) was still observed. Although the best-fitting straight lines were not strong, they were still negative.

![Student 1 graph](image)

*Figure 6*: Student 1 slope of the best-fitting straight line for baseline and intervention phases.

**Student 2.** Student 2 demonstrated a positive slope \((m = 2.6571)\) within baseline phase (see Figure 7). After the self-graphing treatment was introduced, the slope of the best-fitting straight line became slightly negative \((m = -0.3571)\). Although a negative slope was recorded after the self-graphing strategy was applied, Student 2 increased her
correct WPM data points beginning with Session 11. Data points continued to increase for the remainder of the investigation.

**Figure 7.** Student 2 slope of the best-fitting straight line for baseline and intervention phases.

**Student 3.** Student 3 (see Figure 8) displayed positive slopes within baseline and intervention phases. Eight data points were collected during baseline, and in comparison to all other cases, created the strongest positive slope \((m = 4.369)\). Although the slope \((m = 1.4)\) decreased slightly from baseline to intervention phase, Student 3 still demonstrated a positive trend for the remainder of progress monitoring sessions.
Student 3. Figure 8. Student 3 slope of the best-fitting straight line for baseline and intervention phases.

Student 4. Student 4 (see Figure 9) also displayed positive slopes within baseline and intervention phases. Ten baseline data points created a positive slope of the best-fitting straight line \( m = 2.3394 \). After the self-graphing treatment was applied the slope \( m = 9.5 \) indicated rapid increase in correct WPM data points. Among all four cases, Student 4 exhibited the greatest increase in trend and spent the least amount of time in intervention phase.
Assessing Variability in Baseline and Intervention Phases

Figure 10 presents variability (fluctuation of the data) and spread of students’ correct WPM data points within baseline and intervention phases. Three out of four cases established a consistent pattern of less variability within the intervention phase after the self-graphing treatment was applied. Three out of four cases also displayed greater variability wherever the most data points were collected.

Only Student 1 displayed greater variability within intervention phase. She demonstrated a small amount of variability within baseline and also spent the least amount of time in baseline phase. Minimal spread was observed for correct WPM data points during the first four weeks of the investigation. A sudden decrease in correct WPM during Session 11 caused greater variability within intervention phase. The
researcher documented that Student 1 forgot to bring her glasses to Session 11 of progress monitoring.

Student 2 demonstrated a decrease in variability from baseline to intervention phase. Data points fluctuated more within baseline phase than within intervention phase. Student 2 also demonstrated immediate improvement in correct WPM directly after the self-graphing treatment was applied.

In comparison to the other three cases, Student 3 demonstrated the least amount of variability within intervention phase. She also displayed the most fluctuation in data points within baseline phase with number of correct WPM ranging from 25 in Session 3 to 63 in Session 6 (see Figure 10). After the self-graphing treatment was introduced, her correct WPM scores stabilized. During each session of intervention phase, Student 3 read at least 43 correct WPM or more. Although she did not reach a high number of 63 correct WPM again (baseline phase), there was less variability in her data points during the intervention phase.

Student 4 also established a consistent pattern of lower variability within intervention phase than baseline phase. He demonstrated a steady increase in correct WPM per session within baseline phase (reading a high number of 68 correct WPM in Session 6); however, greater fluctuation was recorded within baseline phase. Once the self-graphing treatment was applied the researcher documented a slight decrease in variability, and Student 4 made correct WPM gains in Sessions 12 and 13.
Figure 10. Multiple baseline design that demonstrates variability in correct WPM. Solid black lines reveal the range of data points within baseline and intervention phases.
Consistency Across Data Patterns

Consistency in data patterns across similar phases are displayed in Figure 11 and Figure 12. Figure 11 presents all four students’ baseline data points and Figure 12 presents all four students’ intervention phase data points. The researcher studied data from all phases within the same condition (all baseline phases/intervention phases).

Every student increased number of correct WPM from Session 1 to Session 2 of progress monitoring. This indicated that Tier 2 LLI instruction made an immediate impact on students’ oral reading rates. Only Student 2 continued to increase her correct WPM data point from Session 2 to Session 3; however, she did not continue to increase when progress monitored in Session 4. During Session 6, all four students made at least an 11-word increase in number of correct WPM. When progress monitored in Session 11, three out of four students’ number of correct WPM decreased. This was also Student 4’s first exposure to the self-graphing treatment. In contrast, Student 2 increased her correct WPM by three data points.

In all four cases of this investigation, students read more correct WPM in Session 13 than they originally read in Session 1. A wide range of data points (25-68 correct WPM) was observed within baseline phase. Following implementation of the self-graphing treatment, a decrease in the range of data points (41-64 correct WPM) was recorded.
Figure 11. Consistency across baseline phases for each student. Diamonds represent correct WPM for Student 1. Squares represent correct WPM for Student 2. Triangles represent correct WPM for Student 3. X symbols represent correct WPM performance for Student 4.

Figure 12. Consistency across intervention phases for each student. Diamonds represent correct WPM for Student 1. Squares represent correct WPM for Student 2. Triangles represent correct WPM for Student 3. X symbols represents correct WPM performance for Student 4.
Assessing Immediacy of Effect

Immediacy of effect refers to the change in performance level between the last three data points in baseline phase and the first three data points in intervention phase (Kratochwill et al., 2010). Mean changes in the outcome measure due to the self-graphing treatment are presented in the following sections. Student 2 demonstrated the greatest mean increase immediately after the self-graphing treatment was applied.

Student 1. The effects of the self-graphing treatment were delayed in the case of Student 1’s correct WPM data points. Student 1 (see Figure 13) displayed a slight decrease from 42 to 41 correct WPM from baseline to intervention phase. A mean of 43 correct WPM was documented for the last three data points in baseline and increased to 51 correct WPM for the first three data points of intervention phase. Student 1’s performance level of correct WPM increased, and data points continued to increase from Session 6 to Session 10.
Student 1 phase transition. Change in correct WPM between last three data points in baseline and first three data points in intervention. Grey triangle represents initial decrease in one data point from Baseline 4 (42 correct WPM) to Intervention 1 (41 correct WPM).

**Figure 13.**

**Student 2.** Student 2 displayed immediate gains in correct WPM after the self-graphing treatment was applied (see Figure 14). This is the only case in which a student responded immediately after the self-graphing treatment was introduced. The first two intervention phase sessions demonstrated an increase in correct WPM from 56 to 64. A mean of 46 correct WPM was recorded for the last three baseline data points. A mean increase to 58 correct WPM was documented for the first three intervention phase sessions.
Student 2 phase transition. Change in correct WPM between last three data points in baseline and first three data points in intervention. Grey triangle represents initial increase in one data point from Baseline 6 (55 correct WPM) to Intervention 1 (56 correct WPM).

Student 3. Progress monitoring data for Student 3 revealed a delayed effect from baseline to intervention phase (see Figure 15). Correct WPM data points began to decrease in Session 7 and continued to do so through Session 11, even after the self-graphing treatment was applied. Student 3 did not show an increase in correct WPM data points until the fourth session of intervention phase. A mean of 58 correct WPM was recorded for the last three data points within baseline phase. The mean decreased to 45 correct WPM for the first three data points within intervention phase.
Figure 15. Student 3 phase transition. Change in correct WPM between last three data points in baseline and first three data points in intervention. Grey triangle represents initial decrease in seven data points from Baseline 8 (55 correct WPM) to Intervention 1 (48 correct WPM).

Student 4. Student 4 displayed a delayed effect from baseline to intervention phase (see Figure 16). A decrease of 10 correct WPM was recorded when the self-graphing treatment was introduced. A mean of 56 correct WPM was documented for the last three baseline phase data points and also for the first three intervention phase data points. Even though the performance level of correct WPM did not initially increase, data points continued to increase from Session 12 to Session 13.
Figure 16. Student 4 phase transition. Change in correct WPM between last three data points in baseline and first three data points in intervention. Grey triangle represents initial decrease in ten data points from Baseline 10 (55 correct WPM) to Intervention 1 (45 correct WPM).

Proportion of Overlapping Data

Overlap refers to the proportion of data from intervention phase that overlapped with data from baseline phase. The extent to which there was consistency in the data patterns from phases with the same conditions was examined (Kratochwill et al., 2010). The smaller the proportion of overlapping data points, the more compelling the demonstration of an effect (Kratochwill et al., 2010). Percentage of overlapping data in the cases of Student 1 (see Figure 17) and Student 2 (see Figure 18) was 15%. This small percentage of overlapping data points provides evidence of a potential effect. Both of these students spent the majority of the investigation in intervention phase.
By contrast, Student 3 (see Figure 19) and Student 4 (see Figure 20) both displayed 100% overlap from baseline to intervention phase. Such a large proportion of
overlapping data points does not provide compelling evidence of an effect. In both cases of 100% overlap, students were in baseline phase for the majority of the investigation. Five data points were collected during intervention phase for Student 3 and three data points were collected for Student 4. During Session 6, Student 3 read 63 correct WPM and Student 4 read 68 correct WPM. Neither student read that number of correct WPM during intervention phase, making all data points overlap with baseline phase.

Figure 19. Proportion of overlapping data from Student 3’s baseline to intervention phase. The dashed line represents highest number of correct WPM during baseline phase.
Figure 20. Proportion of overlapping data from Student 4’s baseline to intervention phase. The dashed line represents highest number of correct WPM during baseline phase.

Student Responses

The researcher kept a journal log throughout this investigation. The log was used to record students’ absences, instances of non-response, reading preferences, and reactions to performance. Table 2 displays a pre-baseline and post-intervention phase summary of students’ reading preferences prior to Session 1 and after Session 13 of Tier 2 RtI. Each student verbally responded to informal questions and discussions regarding reading at school, reading aloud, reading silently, and being read to.

Prior to administering the first DORF subtest, three students expressed never wanting to read aloud. Only one student preferred reading aloud all the time. Interestingly, DORF subtests required students to read each passage aloud during each progress monitoring session. On the other hand, all four students enjoyed being read to sometimes or all the time as well as reading silently sometimes or all the time. Prior to
administration of the first DORF subtest, Student 1 never enjoyed reading at school. Student 2 always enjoyed reading at school. Student 3 and Student 4 enjoyed reading at school sometimes, depending on the setting.

A change in students’ reading preferences was documented at the conclusion of the study. When individually asked during Session 13 if they enjoyed reading at school, each student answered sometimes or all the time. Student 3 and Student 4 altered their responses from never wanting to read aloud, to enjoying reading aloud all the time, while Student 1 and Student 2 preferred not to read aloud at all. During the final week of the investigation all four students verbalized how much they enjoyed being read to all the time.
Table 2

Summary of Student Reading Preferences

<table>
<thead>
<tr>
<th></th>
<th>Pre-baseline</th>
<th>Post-intervention</th>
</tr>
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<tbody>
<tr>
<td>Reading at School</td>
<td></td>
<td></td>
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<tr>
<td>Reading Aloud</td>
<td></td>
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<tr>
<td>Reading Silently</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being Read to</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Student 1**

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<th>Pre-baseline</th>
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</thead>
<tbody>
<tr>
<td>Reading at School</td>
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<td>Sometimes</td>
</tr>
<tr>
<td>Reading Aloud</td>
<td>All the time</td>
<td>Never</td>
</tr>
<tr>
<td>Reading Silently</td>
<td>Sometimes</td>
<td>All the time</td>
</tr>
<tr>
<td>Being Read to</td>
<td>All the time</td>
<td>All the time</td>
</tr>
</tbody>
</table>

**Student 2**

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</thead>
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<td>Reading at School</td>
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<td>All the time</td>
</tr>
<tr>
<td>Reading Aloud</td>
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<td>Never</td>
</tr>
<tr>
<td>Reading Silently</td>
<td>Sometimes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Being Read to</td>
<td>All the time</td>
<td>All the time</td>
</tr>
</tbody>
</table>

**Student 3**

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<th>Pre-baseline</th>
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<td>Sometimes</td>
</tr>
<tr>
<td>Reading Aloud</td>
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<td>All the time</td>
</tr>
<tr>
<td>Reading Silently</td>
<td>All the time</td>
<td>Sometimes</td>
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<tr>
<td>Being Read to</td>
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**Student 4**

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<th>Pre-baseline</th>
<th>Post-intervention</th>
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<td>Reading Aloud</td>
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<td>Reading Silently</td>
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<td>Sometimes</td>
</tr>
<tr>
<td>Being Read to</td>
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</tr>
</tbody>
</table>

*Note.* Students’ (N = 4) reading preferences are presented in the first vertical column. Pre-baseline reading preferences are presented in the second vertical column. Post-intervention phase reading preferences are presented in the third vertical column.
Summary

According to Kratochwill et al. (2010), SCD research studies are required to “Include at least three attempts to demonstrate an intervention effect at three different points in time. An effect is demonstrated if the manipulation of the independent variable is associated with predicted change in the pattern of the dependent variable” (p. 15). The present study met requirements for a *Meets Standards with Reservations* multiple baseline design by including a minimum of six phases with at least three data points per phase. The researcher conducted visual analysis by attending to the level, trend, variability of data within baseline and intervention conditions, proportion of overlapping data, immediacy of effect, and consistency of data across similar phases.

In all four cases, the self-graphing treatment produced increases in correct WPM performance levels from baseline to intervention phases. Two students’ mean correct WPM increased by at least nine and two students’ mean correct WPM increased by at least three. Moderate evidence of positive trend (slope of the best-fitting straight line) changes for correct WPM was documented in two cases. Student 3 and Student 4 each demonstrated positive slopes within baseline and intervention phases. Student 1 and Student 2 both revealed slightly negative slopes within intervention phase and spent the least amount of time in baseline phase.

In three out of four cases of the investigation, students established a consistent pattern of low variability within intervention phase. The researcher documented greater variability wherever the most data points were collected. Student 1 and Student 2 displayed compelling evidence of a treatment effect with 15% overlap from baseline to
intervention phase (the majority of intervention phase data points were higher than the lowest number recorded within baseline phase). Student 3 and Student 4 spent the least amount of time in intervention phase, and displayed 100% proportion of overlapping data.

The researcher examined consistency of data patterns within and across baseline and intervention phases. Three out of four students displayed increases in correct WPM data points during the second session of intervention phase. Although immediacy of effect was somewhat delayed, mean increases from baseline to intervention phases were still recorded.
Chapter 5: Discussion

This chapter provides an overview of the multiple baseline single-case design (SCD) investigation. The present study was conducted within a Tier 2 Response-to-Intervention (RtI) model. The researcher examined the effects of self-graphing on Tier 2 second graders’ reading rates, as measured by DIBELS oral reading fluency (DORF) subtests. The researcher also investigated how second graders receiving Tier 2 intervention compare with each other in performance on progress monitoring and self-graphing correct words per minute (WPM) as measured by DORF subtests. Study findings are discussed in the following sections. The researcher’s conclusions are presented as well as a rationale for future research and implications for educators.

Summary of the Study

The purpose of this study was to extend previous research by investigating the effects of a self-graphing treatment on academic reading improvement. Four second grade students receiving explicit reading instruction within a Tier 2 RtI framework were selected for the self-graphing treatment. The use of a SCD to monitor students’ reading rates progress was an effective way to measure oral reading fluency growth. The researcher hypothesized that small-group intensive intervention sessions that include self-graphing could lead to positive effects on reading skills such as oral reading fluency.

A multiple baseline design replication was accomplished across participants with a lag between phase changes. The self-graphing treatment was introduced to students at staggered points in time in order to rule out threats to validity (i.e., history, maturation or other extraneous factors that could account for an observed change). Baseline phases (A
phases) for conditions two through four were extended before introducing the self-graphing treatment to act as verification for the A phase in the first student’s A-B design (Riley-Tillman & Burns, 2009).

**Early intervention.** Explicit teaching instruction is used in a RtI framework. The goal of RtI is to provide the most effective instruction to and intervention for each individual student (Allington, 2009; Fletcher & Vaughn, 2009; Fuchs & Fuchs, 2001, 2005; Howard, 2009; Owocki, 2010; Wanzek & Vaughn, 2008). Tier 2 is instruction that is intended for students performing below grade level in reading. These students receive intensive small-group interventions based on their individual needs (Allington, 2009; TCRWP, 2013). The present study focused on four students receiving Tier 2 high-intensity leveled literacy intervention (LLI) instruction approximately four times per week.

**Sample population.** The population from which the sample was drawn included second grade students who were identified with DIBELS Next benchmark assessments as performing below grade level in reading. Four students were selected based on similarities in age, grade level, developmental level, benchmark assessment results and RtI reading needs. In addition, the researcher and reading interventionist reviewed attendance records prior to selecting the second grade sample. Each participant received 13 weeks of Tier 2 LLI throughout the investigation.

**Progress monitoring measure.** DORF subtests were used as the progress monitoring tool for the duration of this investigation. DORF subtests quickly and efficiently provide an indication of a student’s performance in acquiring oral reading
fluency skills. The changing DIBELS benchmarks allow interventionists to monitor students’ progress using these measures (Good & Kaminski, 2002; Good et al., 2002). All second graders were universally screened with DIBELS Next benchmark assessments in order to identify which students were performing academically below grade level. After students were identified as having reading difficulties, they were placed in Tier 2 RtI and progress monitored once per week using DORF subtests. The DORF subtests required students to read passages orally for one minute. The subtest administrator (researcher/interventionist) followed along and marked the readers’ responses in scoring booklets according to the DORF scoring rules. At the end of one minute, each administrator placed a bracket in the text after the last word provided by the student.

**Self-graphing.** Self-graphing is a condition in which students record their own results on a graphic display. It is performed in order to self-monitor accuracy or performance (Magnan, 2006), and includes reinforcement for achieving self-selected goals (Lee et al., 2009; Rhode et al., 1983). In the current investigation, self-graphing quantifiably displayed students’ DORF results and allowed them the opportunity to assess whether or not there was an increase in performance. Previous SCD research indicated a link between self-graphing and academic improvements in reading (Dunlap & Dunlap, 1989; Gunter et al., 2003; Reid, 1996; Shimabakuro et al., 1999). The present study extended previous research by examining the effects of self-graphing within a Tier 2 LLI framework.
Data Analysis and Findings

Kratochwill et al. (2010) required SCD research studies to include, “At least three attempts to demonstrate an intervention effect at three different points in time with three different phase repetitions” (p. 15). The present study made four attempts to demonstrate a self-graphing effect at four different points in time. According to Kratochwill et al. (2010) in order to Meet Standards with Reservations a multiple baseline design, “Must have a minimum of six phases with at least three data points per phase. To Meet Standards a multiple baseline design must have a minimum of six phases with at least five data points per phase” (p. 16). The present study Meets Standards with Reservations because, in the case of two students, less than five data points were documented per phase.

Assessing performance level in baseline and intervention phases. When the self-graphing treatment was implemented in the first A-B condition, the researcher observed an increase in mean correct WPM (outcome data). At the end of this study, the researcher documented mean increases from baseline to intervention phase in the case of all four students. Following self-graphing treatment application across all cases, Student 1 and Student 2 displayed the strongest mean increases. Both students spent the least amount of time in baseline phase. Four baseline data points were collected for Student 1 and six baseline data points were collected for Student 2.

Student 3 and Student 4 also displayed mean increases from baseline to intervention phase by an average of three or more correct WPM. After observing an increase in the first two cases, it is possible that if intervention phases were extended for
Student 3 and Student 4, means may have been even higher. Overall, the observed reading behaviors were altered in all cases when the self-graphing treatment was applied.

**Assessing trend in baseline and intervention phases.** Observed and projected patterns of the outcome data variable were compared in the cases of all four students. Student 1 demonstrated a slightly negative slope after the self-graphing treatment was applied. Although she displayed an increase in slope from baseline to intervention phase, the best-fitting straight line remained negative throughout intervention phase. It should be noted that in this particular case, the data may be somewhat unreliable because Student 1 forgot to bring her glasses to Session 11. Her inability to read the passage clearly may have caused a sudden drop in her correct WPM score during Session 11. Had Student 1 remembered to bring her glasses and read at least 52 correct WPM (intervention phase mean, the slope would have been positive \( m = 0.2833 \) instead of negative \( m = -0.0833 \).

Student 2 demonstrated a positive slope during intervention phase; however a negative slope of the best-fitting straight line was documented after the self-graphing treatment was introduced. This is the only case in which a student’s slope did not increase from baseline to intervention phase. Student 2’s correct WPM data points began to increase after a low data point (48 correct WPM) was collected during Session 10. Number of correct WPM improved starting with Session 11 and continued through Session 13. Perhaps if the intervention phase had been extended, Student 2 would have continued to increase her correct WPM, eventually displaying a positive trend. It is also
possible that after more time spent in baseline, the first two students would have felt more comfortable reading aloud and performed higher in both intervention and baseline phases.

Student 3 and Student 4 both displayed positive slopes within baseline and intervention phases. Student 3 displayed the strongest positive slope within baseline, which consisted of more data points than her intervention phase. Student 4 exhibited the strongest positive slope out of all cases after the self-graphing treatment was applied. Only three data points were collected during Student 4’s intervention phase. It is unknown, had this phase been extended, if the positive trend would still be as strong. Based on the patterns evident in the data collected from the three other students, it is reasonable to conclude that Student 4 would still have displayed a positive slope, but the scores may have fluctuated more as time went on.

In comparison to the other three participants, if the slope of the best-fitting line for Student 1 had been positive, three demonstrations of positive trends would have been documented, helping to provide Strong Evidence (Kratochwill et al., 2010) for a causal claim. Since only two demonstrations of positive intervention phase slopes were documented, the present study found Moderate Evidence of a treatment effect.

**Assessing variability and consistency across data patterns.** The researcher determined that three out of four students established a consistent pattern of less variability within intervention phase after the self-graphing treatment was applied. This pattern provides Moderate Evidence of a treatment effect (Kratochwill et al., 2010). In addition, after the self-graphing strategy was applied, three students read more correct WPM per session than they read during their lowest recorded baseline phase session.
In three cases, greater variability was displayed wherever the most data points were collected (baseline or intervention phase). Three students displayed their lowest and one student’s second lowest intervention phase data point during Session 11. It could be that students did not connect to this DORF subtest passage as well as the other reading passages, or the content did not make sense and/or relate to their lives. Fountas and Pinnell (2001) determined, “Readers constantly search for connections between what they already know and what they encounter in a text” (p. 316). If students were unable to connect to the text, more than likely they did not understand some of the words they were reading aloud. Miller (2002) reported how difficult it is for students to apply reading strategies when they hardly know and/or understand any of the words in a text.

Interestingly, all students performed well, reading between 55-68 correct WPM during Session 6. These data points caused the researcher to think this particular reading passage interested readers more than the other passages, or for some reason students were more focused than usual during RtI that day. Shanahan et al. (2010) reported, “Students must actively engage with text to extract and construct meaning” (p. 34). It is possible that all four students were able to make text-to-self, text-to-text, and/or text-to-world connections (Fountas & Pinnell, 2001; Harvey & Goudvis, 2000; Miller, 2002), which would help to expand their understanding of the words they were reading in the text.

**Assessing immediacy of effect and proportion of overlapping data.** Immediacy of effect refers to the change in level of correct WPM between the last three data points within baseline phase and the first three data points within intervention phase (Kratochwill et al., 2010). Student 1 and Student 2 immediately responded to the self-
graphing treatment. Each of their mean correct WPM increased from the last three data points of baseline phase to the first three data points of intervention phase. Initially, Student 4’s mean remained the same (56 correct WPM) at the end of baseline phase and the beginning of intervention phase. After additional intervention phase data points were collected, his mean increased. Student 3 is the only case in which an immediate decrease in mean correct WPM was documented.

Proportion of overlap between baseline and intervention phases was also considered during visual analysis. The researcher determined there was too much overlapping data to conclude that a functional relationship exists for this criterion. Although only 15% overlap was documented for both Student 1 and Student 2 (making compelling evidence for an effect), 100% overlap was recorded for Student 3 and Student 4. It is possible, that because the last two students were in intervention phases for such a short period of time, they did not have enough exposure to the self-graphing treatment. Student 3 and Student 4 may have read a higher number of correct WPM if intervention phases were extended. Both students displayed an increase in their final two sessions. This pattern gives reason to believe their correct WPM would have continued to increase.

**Researcher Reflections**

The researcher kept a journal log during this investigation. The log was used to record students’ absences, instances of non-response, reading preferences, and reactions to performance. As mentioned in Chapter 4, imputed mean data was used in the cases of two student absences.
Prior to implementation of the study, the researcher anticipated students’ mean correct WPM would increase from baseline to intervention phases because students would enjoy monitoring their own progress during Tier 2 RtI. Although this proved to be true, the researcher was surprised by the response of at least three students’ expressing lack of enjoyment reading aloud prior to the start of this investigation. The researcher also kept in mind that being a guest in the elementary school building might make students hesitant when reading aloud during progress monitoring sessions.

Students’ pre-baseline and post-intervention reading preferences provided the researcher with insight as to why they may have performed the way they did. For instance, three out of four students mentioned they disliked reading aloud all of the time. Only Student 1 expressed her enjoyment of reading aloud all of the time, yet her baseline phase mean correct WPM was the lowest. After the self-graphing treatment was applied, she made the second highest mean increase from baseline to intervention. It is possible that her confidence and desire to read aloud helped increase the performance level of correct WPM read.

Perhaps it took students time to become comfortable during baseline phase progress monitoring, because by the end of the study two students claimed to enjoy reading aloud sometimes. Two students continued to feel the same way they did prior to the investigation, reporting that they never enjoy reading aloud. Interestingly, Student 1 changed her response from enjoying reading aloud all the time to never enjoying reading aloud post-intervention phase. At the end of the study she claimed to enjoy reading silently all the time. It could be that because her reading rate increased over time, she
gained confidence in her reading abilities and became more comfortable reading silently to herself.

Table 3 displays comparisons according to visual analysis criteria between Student 1 and Student 2. Both students spent the majority of this investigation in intervention phase and were exposed to the self-graphing treatment longer than Student 3 and Student 4. Both students demonstrated mean increases of nine (Student 1) and 12 (Student 2) correct WPM from baseline to intervention phase. The researcher recorded compelling evidence of a treatment effect with 15% overlap in both cases and documented immediate self-graphing effects. It appeared as though each of these students became more independent and self-motivated as the investigation progressed. Interestingly, post-intervention reading preferences indicated that both Student 1 and Student 2 no longer preferred reading aloud. This indicated an increase in self-confidence and reading ability. Each student began to assume responsibility for her own reading progress, demonstrating self-motivation and commitment toward improving reading skills in Tier 2.
Table 3

*Student 1 versus Student 2 Results*

<table>
<thead>
<tr>
<th>Baseline to Intervention Phase</th>
<th>Student 1</th>
<th>Student 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td>Mean increase of 9 correct WPM</td>
<td>Mean increase of 12 correct WPM</td>
</tr>
<tr>
<td>Trend (intervention phase slope)</td>
<td>m = -0.0833</td>
<td>m = -0.3571</td>
</tr>
<tr>
<td>Variability</td>
<td>Greater fluctuation in intervention phase</td>
<td>Less fluctuation in intervention phase</td>
</tr>
<tr>
<td>Proportion of Overlap</td>
<td>15% overlapping data points</td>
<td>15% overlapping data points</td>
</tr>
<tr>
<td>Immediacy of Effect</td>
<td>Mean increase of 8 correct WPM</td>
<td>Mean increase of 12 correct WPM</td>
</tr>
</tbody>
</table>

*Note.* Results from baseline to intervention phase for Student 1 and Student 2 are presented. Similarities in level, trend, proportion of overlap and immediacy of effect are displayed.

Table 4 displays comparisons according to visual analysis criteria between Student 3 and Student 4. Both students spent the majority of this investigation in baseline phase and were exposed to the self-graphing treatment for short periods of time. Both students demonstrated mean increases of four (Student 1) and six (Student 4) correct WPM from baseline to intervention phase, however the researcher did not record compelling evidence of a treatment effect for proportion of overlap (100% in both cases). Results also displayed only moderate evidence for immediacy of effect. Interestingly, Student 1 and Student 2 both exhibited positive slopes and less variability in the intervention phases. It is possible that the short amount of time spent in intervention phase kept data fluctuation to a minimum.

Post-intervention reading preferences indicated that Student 3 and Student 4 wanted to read aloud all the time. Prior to the investigation neither student ever wanted to read aloud. After self-graphing was introduced, both students seemed more eager to read aloud during progress monitoring. Student 4 was particularly tentative during
progress monitoring early in the investigation, but appeared committed to increasing his reading rate after he began plotting his correct WPM on a graphing display.

Noticeable differences between Student 1 and Student 2 results versus Student 3 and Student 4 results were recorded. The researcher determined that students who were exposed to the self-graphing treatment for longer periods of time (Student 1 and Student 2) displayed strong evidence of a treatment effect. These same two students were self-motivated for the majority of the study. Had the treatment been applied to Student 3 and Student 4 earlier, they may have displayed similar attitudes and results. Overall, self-graphing was a motivating factor during Tier 2 progress monitoring.

Table 4

**Student 3 versus Student 4 Results**

<table>
<thead>
<tr>
<th>Baseline to Intervention Phase</th>
<th>Student 3</th>
<th>Student 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level</strong></td>
<td>Mean increase of 4 correct WPM</td>
<td>Mean increase of 6 correct WPM</td>
</tr>
<tr>
<td><strong>Trend (slope)</strong></td>
<td>m = 1.4</td>
<td>m = 9.5</td>
</tr>
<tr>
<td><strong>Variability</strong></td>
<td>Less fluctuation in intervention phase</td>
<td>Less fluctuation in intervention phase</td>
</tr>
<tr>
<td><strong>Proportion of Overlap</strong></td>
<td>100% overlapping data points</td>
<td>100% overlapping data points</td>
</tr>
<tr>
<td><strong>Immediacy of Effect</strong></td>
<td>Mean remained the same</td>
<td>Mean decrease of 10 correct WPM</td>
</tr>
</tbody>
</table>

*Note.* Results from baseline to intervention phase for Student 3 and Student 4 are presented. Similarities in level, trend, variability and proportion of overlap are displayed.

**Self-graphing Treatment**

Prior to revealing each graph for the first time, the researcher placed silver star-shaped stickers on baseline phase data points and drew a line connecting each point. When students were introduced to their graphs, they were exposed to visual
representations of progress up to that point. In all four cases, students expressed excitement upon seeing their poster-size graphs for the first time. Every student smiled and appeared eager to plot his/her initial intervention data point. Magg et al. (1993) reported in addition to academic productivity, self-monitoring different target variables can differentially affect students’ academic engagement.

After students entered intervention phase, once per week they chose a colored star sticker to plot the correct WPM data point and used a pen and ruler to draw a line connecting the most recent data point to the previous week’s data point. Throughout this investigation it was evident that students enjoyed plotting their own data. They acted genuinely interested in their progress and appeared proud of themselves when the correct number of WPM increased. If a data point decreased from the week before, each student made comments noting the drop in correct WPM. DiGangi et al. (1991) determined, “Self-graphing appears to be a potentially powerful variable for enhancing reactivity of self-monitoring” (p. 228). Not only did students react positively to the introduction of self-graphing correct WPM, they looked forward to graphing data points at the end of each session. The self-graphing strategy revealed emotions in students that might not have been evident during business as usual progress monitoring.

Limitations

As a direct consequence of SCD methodology, the current study encountered limitations, which need to be considered. For this investigation the researcher based inferences on visual analysis. Visual analysis can be considered a limitation because visual inference is guided primarily by common sense; therefore few guidelines exist for
Regarding determining causal relation, Kratochwill et al. (2010) stated, “Currently, there is no formal basis for the ‘three demonstrations’ recommendation; rather it represents the conceptual norm in published articles, research, and textbooks that recommend methodological standards for single-case experimental designs” (p. 5). After the researcher evaluated level, trend, variability, immediacy of the effect, proportion of overlapping data and consistency of data patterns across phases in order to document an intervention effect, a rating of Moderate Evidence (Kratochwill et al. 2010) was determined. This conclusion was made by analyzing students’ data points within and across baseline and intervention phases.

Due to the nature of this multiple baseline design, it is not generalizable to large sample populations. However, the self-graphing treatment could be applied in other small-group Tier 2 settings, especially those receiving LLI instruction. Since Tier 2 RtI is a high-intensity, small group instructional model, self-graphing can be used in a variety of ways to monitor academic progress.

**Conclusions**

The purpose of this investigation was to determine whether a causal relation existed between the introduction of self-graphing and a change in correct WPM. The present study provided three demonstrations of an effect and also included one demonstration of a non-effect, therefore producing Moderate Evidence (Kratochwill et al., 2010) of a causal relation. In order to document Moderate Evidence, visual analysis was conducted by attending to the level, trend and variability of data within the baseline and intervention conditions, and in comparison to the baseline and intervention
conditions. Consistency of data patterns across phases, immediacy of effect and proportion of overlapping data were also analyzed. The data observed are reliable because the researcher adhered to the requirements for *Meets Evidence Standards with Reservations* (Kratochwill et al., 2010) in a multiple baseline design.

**Implications for educators.** Administrators, teachers, interventionists, and special educators should make data collection part of a continuing sequence of instructional improvement (Bradley et al., 2007; Cummings et al., 2008; Fuchs & Fuchs, 2001; Gersten et al., 2009; Owocki, 2010). Educators should choose methods for progress monitoring and collect data from a variety of sources (Clay, 2002; Owocki, 2010). These are prerequisites to implementation of a self-graphing strategy. In order for students to participate in self-graphing, accuracy of performance must first be assessed in some way. As reported in Chapter 2, self-monitoring performance (SMP) can have a positive effect on academic performance (Dunlap & Dunlap, 1989; Maag et al., 1993). The present study determined that self-graphing has a *Moderate Effect* on oral reading rate. When students participated in graphing their own data, reading rates gradually increased.

Hamilton et al. (2009) explained that in order for students to analyze their own achievement data, they need to understand how their academic performance fits with the task(s) set out for them by the classroom teacher. As previously mentioned, students’ analysis of their own assessment data combined with feedback from their teachers can lead to significant gains in achievement (Gersten et al., 2009). Teachers must trust their students enough to give them the time and the tools to think for themselves (Miller,
2002). In order for students to feel comfortable and confident while graphing their results, Miller (2002) urged educators, “Teach them how to go after something if they really want it, and teach them the rewards of hard work and determination” (p. 21). The current researcher recommends whether it be in Tier 2 RtI, Tier 3 RtI, the general classroom, or the special education classroom, that teachers and interventionists encourage self-regulated learning. Students self-regulating their accuracy of academic performance has proven valuable (Mahoney & Thoresen, 1974). Seeing academic progress on a graphic display could prove to be very powerful for students in a variety of settings.

If teachers utilize a self-graphing treatment in the context of this design, it could motivate students to want to improve their reading skills. Students might begin to take ownership and responsibility of their learning (Pearson & Gallagher, 1983) when given the opportunity to evaluate their own progress. Students might also become more motivated to give their best effort in whole-group and/or small group settings. Shanahan et al. (2010) reported, “They will become better readers if they are taught reading in an engaging, motivating context” (p. 34).

Although the current study was implemented within a Tier 2 RtI setting, teachers can also develop opportunities on a weekly and/or daily basis for students to self-graph academic results within the general classroom setting. Hamilton et al. (2009) stated, “Teachers should articulate the content knowledge or skills that they expect students to achieve throughout the school year, conveying goals for individual lessons and assignments” (p. 20). Self-graphing can be implemented across multiple subject areas,
and although the present study focused on reading fluency skills; mathematics, science, social studies, and other subject areas can be incorporated into SMP.

**Recommendations for Further Research**

This investigation expanded upon previously reported self-monitoring studies in order to investigate usefulness of self-monitoring interventions for students with learning difficulties (Boswell et al., 2013; Ballard & Glynn, 1975; Glynn & Thomas, 1974; Glynn et al., 1973; Holifield et al., 2010; McDougall & Brady, 1988; McDougall et al., 2012; Prater et al., 1991). Although literature conveyed it is challenging for students with learning difficulties to actively self-regulate their behavior (Harris, 1986b; Mercer, 1991), a basic self-graphing strategy such as the one used in this investigation could yield positive academic and behavioral results. Self-monitoring recording forms should be kept simple and manageable so students are able to efficiently track their own progress (Howard, 2009). Previous study results demonstrated that introduction of a self-monitoring package produced immediate and dramatic gains in accuracy of performance in the cases of students with learning difficulties (Dunlap & Dunlap, 1989; Maag et al., 1993).

Research in the area of self-graphing reading fluency is in need of further contributions. In order to better understand the effects of self-graphing and to establish reliability of the current findings, future researchers should implement the current multiple baseline design amongst other students receiving Tier 2 intervention. Self-graphing can be utilized with more than one Tier 2 RtI group at a time, and in order for practitioners to implement self-graphing oral reading fluency they may want to extend
baseline and intervention phases. For instance, four of the same grade level Tier 2 student groupings could participate in the study simultaneously, and for longer periods of time.

This investigation was conducted on a sample size of four participants. The effects of self-graphing oral reading fluency may be more clearly understood with more participants in order to evaluate trends. Future researchers could also examine the effects of self-graphing on other grade level students receiving Tier 2 instruction. Additionally, it would be interesting to document the effects of implementing self-graphing among small-groups of students or individual students within the general classroom setting.

**Summary**

This multiple baseline investigation examined the effects of self-graphing on students’ oral reading rates. The theoretical framework proposed that students graphing their Tier 2 progress monitoring results would have an effect on number of correct WPM. The literature implied that when students at-risk for reading difficulties are identified early and provided with high-intensity instruction, many develop the skills needed to make significant reading gains (Foorman et al., 1998; Torgesen et al., 1999; Vellutino et al., 1996). The researcher aimed to deliver to students with reading difficulties a strategy that could increase their fluency by requiring them to plot their own data points on a graphic display. According to each student’s baseline and intervention phase results, the researcher determined *Moderate Evidence* (Kratochwill et al., 2010) of a causal effect.

The underlying conclusion of the data is that when students who receive Tier 2 LLI instruction graph their own progress, reading rates increase. Gradually releasing the
responsibility (Pearson & Gallagher, 1983) of self-graphing from interventionist to student proved useful in this investigation. Students appeared genuinely optimistic when their correct WPM increased and slightly surprised and/or disappointed when their correct WPM decreased. They were excited to independently plot data points in order to display their own results. Gersten et al. (2009) determined that students who require the most intensive instruction need to be given multiple opportunities to practice with immediate feedback. The researcher gave students an opportunity to graph their oral reading rates, and by doing so provided them with immediate and individualized feedback. The individualized nature of this self-graphing strategy leads to positive academic outcomes.
References


doi:10.1080/10862967909547342


doi:10.1901/jaba.1975.8-387


Northwest Evaluation Association (2014). *MAP (Measures of academic progress)*

_frequently asked questions_. Retrieved from


doi:10.1177/00222194050380050701


doi:10.1037/0022-0663.72.2.250


doi:10.1207/s1532690xci0102_1


Appendix A: Participant Information

What is the student’s level of performance according to DIBELS second grade benchmarks?

A) Has never reached the goal  
B) Is somewhat close to reading the goal

What is the variability of the student’s WPM data?

A) Stable  
B) Highly variable

Describe the student’s motivation when receiving leveled literacy intervention (LLI) instruction.

A) The child appears to be motivated and willingly participates.  
B) The child appears to be unmotivated and chooses not to participate.

What is the student’s Tier 2 Response-to-Intervention attendance history?

A) Consistently present  
B) Occasionally present
Appendix B: Self-graphing Protocol Initial Session

Self-Graphing Protocol (Initial Session)

Before administering the Dynamic Indicators of Basic Early Literacy Skills oral reading fluency (DORF) assessment, inform the student that today you will be doing something new when he/she finishes reading.

➢ Explaining something new:

“I’ve been keeping track of your reading each week. This is a graph that I made based on your correct words per minute.”

➢ What is the child’s role?

“Starting today, after you finish reading aloud to me, I will tell you how many words you read correctly in one minute. Then you will use a sticker to mark that number of words on your graph.”

➢ Show student the graph he/she will use and model how to use the x-axis to locate weekly sessions and the y-axis to locate correct words per minute (WPM).

“Let’s look at the number 1 on this line (x-axis). This number represents the first week that you read aloud for one minute during RtI. You read ____ words correctly. How many correct words did you read the next week? Let’s look at how many words you read correctly last week.

➢ Explain to the child why we are graphing reading rate.
“This is called a line graph. Starting today, you are going to keep track of your own progress. Each week you will record your correct words, and then see how your rate changes from last time, or if it stays the same.”

“I’m wondering, what will happen over time when you monitor your words per minute?”

➢ Administer DORF running record assessment. After the student finishes reading, tell the student how many correct words per minute he/she read.

“Now it’s time for you to give this a try! Choose a sticker and place it above week ___ (point to week) and then go up to number ____ and plot your sticker. Next, use this ruler to draw a line connecting the dots.”

“Did you read more words per minute this week than last week? (Is this dot higher or lower than last week’s dot?)”

➢ Have a conversation with the child.

“This will be a great way to keep track of how you’re doing. I’ll be curious to see if you read more, less, or the same amount of correct words each week.

➢ Explain weekly self-graphing process.

“From now on, before you begin reading aloud, we’ll look at your graph to see last week’s progress. After we finish looking at your graph, you will read aloud for one minute. When you finish I will tell you the amount of words you read correctly and you will plot your score with a new sticker. Using a ruler you’ll be able to connect the lines from last week’s score to your new score. After that we’ll talk about your progress!”
Appendix C: Weekly Self-graphing Protocol

Weekly Graphing Protocol

- Before administering the DORF assessment remind student that afterwards he/she will graph correct words per minute. Allow the student to observe his/her graph.

“After you finish reading today, you’ll graph your progress again! I will tell you the amount of words you read correctly and you’ll plot your score with a new sticker.”

- Administer DORF running record assessment. Afterwards, tell the student how many correct words per minute he/she read.

“Are you ready to graph? Remember to find the number of correct words you read on the y-axis. Then place your sticker above week ___ on the x-axis. Use this ruler to help you draw a line connecting the dots.”

- Have a conversation with the child about student progress.

“Let’s compare your new score to last week’s score. Did you read more or less correct words per minute this week?”