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Linking Reading Assessment Data to Intervention Using the 4-Box Instructional Decision Making Model

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By

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Abstract

Reading is a vital skill and failing to learn how to read has consequences beyond the walls of the classroom. The importance of reading and its link to later success in life has gained the attention of many, including Congress, over the past couple of decades. Yet, despite an intense research focus and large amounts of time and resources being devoted to improving reading performance, too many American students continue to struggle to obtain reading proficiency. One possible explanation for this disconnect maybe the failure to match evidence-based instruction to struggling readers based on their specific reading needs. The *4-Box Instructional Decision Making Model* developed by Harkin in 2008 is a promising tool that may improve the ability of educators to match struggling readers to effective interventions. The 4-Box Instructional Decision Making Model is discussed and its effectiveness in identifying students in need of reading interventions and linking them to evidence-based reading interventions are displayed.

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Chapter I: Introduction

The Importance of Reading

The ability to read and its importance to later success in life cannot be overstated. Reading is a vital skill for most learning and is linked to opportunities for academic, social, and vocational success (Gerber, 1997). Adults with low levels of literacy and education are more likely to be unemployed or earning an income below the poverty line than adults with higher levels of literacy and education (Kutner, et al. 2007). The ability to read is also linked with being incarcerated. A study by Greenberg, Dunleavy, & Kutner (2007) indicated that individuals in prison have lower reading levels than comparison groups in the general population. Also, students who fail to read proficiently by third grade are four times less likely to graduate on time (Hernandez, 2011) and adults who fail to graduate high school are more likely to be incarcerated (Harlow, 2003).

In the school setting, third grade is often the focal point when it comes to reading ability. Prior to the end of third grade, instruction generally focuses on teaching students how to read, but in fourth grade, students are expected to use their reading skills to learn new information independently (Fiester, 2010). Students who fail to read proficiently by the end of third grade struggle to comprehend future curriculum materials and often fall behind their peers in meeting educational demands as they continue their education (Lesnick, George, Smithgall, & Gwynne, 2010).

Students who struggle to become proficient in reading are also more likely to struggle emotionally and behaviorally. Armbruster, Lehr, and Osborn (2001), reported that by the end of first grade, students who struggle in comparison to their peers to learn basic reading skills are more likely to experience lower self-esteem, self-concept, and motivation to learn how to read. Research by Arnold et al. (2005) and Wasson, Beare, and Wasson (1990) indicate that poor

readers are more off-task, less engaged in instruction, and have higher reported incidences of delinquent behavior. Poor readers are also more likely to exhibit social skills deficits, experience peer rejection, and exhibit antisocial behaviors (Kavale & Forness, 1996; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006).

A Call for Better Reading Instruction

The consistent research findings showing the critical importance of reading to success not only in school, but later in life led many to call for more emphasize to be placed on reading instruction within the field of education. In 1997, congress called for the formation of the National Reading Panel to evaluate the effectiveness of strategies used to teach children to read. Subsequently a report was published in 2000 titled, "Teaching Children to Read," which provided a review of reading research related to how to teach critical reading skills and addressed what instructional methods, materials, and approaches are most beneficial for various students based on the research literature (National Institute of Child Health and Human Development, 2000). Federal policies have also been enacted such as the No Child Left Behind Act (NCLB, 2002) and the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) which mandate data-driven decision-making. As a result, schools are implementing practices such as Response to Intervention and collecting curriculum-based measurement data in order to better meet the needs of their students.

Response to Intervention

Response to Intervention is a systematic and data-based approach to instruction, assessment, and intervention (U.S. Department of Education, Office of Special Education Programs, National Center on Response to Intervention, 2013). The primary focus of RTI is prevention with increasing levels or tiers of support being provided to students based on need. In

tier 1, all students are provided with high-quality core instruction and universal screening is completed to identify which students are failing to make acceptable progress. Those students who fail to make acceptable progress in tier one move to tier two and receive evidence-based instruction targeted to their needs in addition to the core instruction. Tier two is generally conceptualized as moderately intensive small group instruction during which students are progress monitored in order to determine the student's rate of improvement or lack thereof when provided with this additional instruction. Students who struggle to make progress in tier two are moved to tier three in which they receive even more intensive evidence-based instruction specifically targeted to their individual needs. Again progress monitoring is conducted to examine the student performance when they are exposed to the more intensive individualized instruction.

When compared to the traditional approach of identifying and educating struggling students, RTI seems to clearly be a better alternative. The traditional approach, often referred to as the "wait to fail" model, waits for students to develop significant skills deficits and for teachers to identify these deficits and refer students for special education testing. This process has many disadvantages including the late identification of special needs students, an inaccurate and biased screening method, the possibility of students not being identified or receiving additional support, and the use of assessments that are not linked to instruction (Vaughn & Fuchs, 2003).

RTI addresses many of the short comings of the traditional approach. First of all, RTI requires the screening of all students, not just those strongly suspected of academic deficits. Therefore, all students at risk for academic difficulties are identified early and receive immediate intervention to help improve academic skills (Vaughn & Fuchs, 2003). This is important given

that students who do not learn to read by the end of first grade tend to remain poor readers (Juel, 1988) and that interventions for struggling readers after third grade are seldom as effective as those in earlier years (Fiester, 2010). Also, RTI uses curriculum-based measurement which is standardized and has been shown to meet general standards for reliability and validity (Hosp, Hosp, & Howell, 2007). As a result, teachers have valuable data to help inform their instructional decisions thereby decreasing the potential of not identifying struggling students and allowing personal bias to factor into these decisions.

Curriculum-Based Measurement

At the heart of the any successful implementation of RTI is assessment, particularly Curriculum-Based Measurement (CBM). CBM is a valid and reliable assessment tool that fits well into RTI as it incorporates data-based decision-making into instructional planning (Deno, 1985).

CBM consists of a standardized set of directions, procedures, and scoring rules and involves the use of a timing device and set of materials similar to the student's curriculum (Hosp et al., 2007). The majority of CBM measures produce scores in the form of rate, or number of correct responses over a given amount of time. The data produced from CBM measures are commonly used for determining the effectiveness of instructional programs, establishing instructional groups, and identifying students in need of academic interventions (Roehrig, Duggar, Moats, Glover, & Mincey, 2008).

There are three different types of CBM that differ based on purpose and type of skills assessed (Hosp et al., 2007). General outcome measures assess performance on one complex task that involves the application of a variety of skills all at the same time (Hosp et al.). Oral reading fluency is one such general outcome measure. In order to read fluently, students must

read both accurately and quickly while incorporating a variety of skills such as decoding, vocabulary knowledge, and content knowledge. Any improvement in any of these reading skill areas should result in an improvement in oral reading fluency. General outcome measures are useful for screening and progress monitoring over long periods of time as they are able to illustrate retention of previously taught information and the generalization of new materials at the same time (Hosp et al.). The disadvantages of general outcome measures are that they fail to provide information about specific skills and provide little diagnostic information (Hosp et al.).

Skills-based measures are used to assess performance when there is not one single task that encompasses the successful application of all of the necessary skills at once (Hosp et al., 2007). For example, in math there are many different skills (e.g. single digit addition, double-digit addition without grouping, etc.) that should be mastered by the end of each grade level, but a single task does not exist to measure all of these skills at the same time. Instead, a skills-based measure can be developed that includes problems from all the possible computation skills that are expected for that grade level. Skills-based measures are primary used for screening and measuring progress over a longer period of time (Hosp et al.). The primary advantage of skills-based measures are their ability to provide an overall impression of skill level, but skills-based measures are limited when it comes to diagnostic utility because the measure includes such a small sample for each specific skill (Hosp, et al.).

Mastery measures, the third type of CBM, are narrowly focused and used to assess performance on a specific academic skill such as producing the names of letters or solving single digit addition problems (Hosp et al., 2007). Mastery measures are useful for evaluating proficiency in a specific content area and for diagnostic evaluation (Hosp et al.). However,

mastery measures are not good for examining overall levels of performance or monitoring progress over long periods of time (Hosp et al.).

Oral reading fluency. When it comes to curricular-based measurement of reading, oral reading fluency is the skill most frequently assessed (Hosp et al., 2007). Performance on oral reading fluency measures is an excellent indicator of overall reading performance since the ability to read fluently requires the use of many different reading skills such as decoding and vocabulary knowledge (Hosp, et al.). Therefore, oral reading fluency CBMs are considered general outcome measures. Oral reading fluency measures provide information such as the number of words read correct per minute and accuracy rate. This information can then be used to identify students at risk in a couple of different ways. First of all, student scores can be compared to performance benchmarks that predict the likelihood of success on high-stakes assessments. Secondly, student scores can be compared to normative data which provides a percentile rank of that student in relation to other students at the same grade level.

Oral reading fluency is a complex task that involves the application of a variety of reading skills all at the same time and therefore is considered a general outcome measure. Like other general outcome measures, oral reading fluency measures provide little in the form of diagnostic information and fail to provide information about specific reading skills (Hosp et al., 2007). As a result, the use of oral reading fluency CBMs for the purpose of informing instruction is limited (Fuchs, Fuchs, Hosp, & Hamlett, 2003).

Statement of the Problem

Despite the increasing use of RTI and CBM, American schools continue to struggle to improve reading achievement. According to the National Assessment of Educational Progress, 67% of fourth graders and 66% of eight graders failed to achieve grade-level proficiency in

reading in 2011 (Aud et al., 2013). These statistics are even more unacceptable when students from low-income families are considered, as the percentage of fourth grade students from low-income families failing to meet grade-level expectations in reading was 82% in 2011 (Aud et al.). When examined over time, it is clear that there has been little change in reading proficiency over the past two decades. In 1992, the number of fourth graders failing to meet grade level proficiency was 72%, while the number of eighth graders failing to meet grade level of proficiency was 71% (Aud et al.).

Data collected from special education services delivered in schools also indicate that reading remains a significant problem for many students. According the U.S. Department of Education National Center for Education Statistics (2011), 5% of individuals between the ages of 5 and 21 attending public schools receive special education services and roughly 80% of these students have reading as their primary area of deficit (Moats & Dakin, 2007).

So why the lack of significant improvement in reading proficiency despite the increased emphasis on the use of RTI and CBM? One possible explanation is the failure to match evidence-based instruction to struggling readers based on their specific reading needs. Riley-Tillman, Burns, & Gibbons (2013) point out that interventions are only useful for a particular range of problems and failing to match evidence-based interventions correctly with a problem it is not designed to address is not likely to lead to improvement. This scenario of incorrectly matching evidence-based instruction to struggling students is easy to understand given many schools current use of CBM for reading. As pointed out by Hosp et al. (2007), oral reading fluency is the most commonly used CBM for reading and because it is a general outcome measure it is commonly used to screen all students to identify those who are struggling with reading. Although oral reading fluency measures are useful for identifying students who are

struggling to read fluently, it does not directly indicate why the students are struggling to read fluently nor does it assess reading comprehension. Therefore, the utility of knowing only the number of words read correct per minute for informing instructional plans is limited (Fuchs et al., 2003). Unfortunately, in many cases further assessment and analysis of student reading difficulties does not occur and reading interventions are chosen based on what interventions are available, which interventions are familiar to the interventionist, and which interventions require the least amount of time and effort (Burns, Riley-Tillman, & VanDerHeyden, 2012). As a result, these interventions often result in struggling readers making minimal to no progress.

Purpose of the Study

The purpose of this study is to examine the effectiveness of matching struggling readers to evidence-based reading interventions through the use of reading assessment data. More specifically, a 4-Box Instructional Decision Making Model will be utilized to analyze student reading data and guide instructional decision making.

Research Question

The research question being examined in this study is, does the use of the 4-Box Instructional Decision Making Model in guiding reading intervention selection produce better reading outcomes for struggling readers when compared to their previous reading performance using interventions chosen through alternative methods?

Chapter II: Literature Review

Methods of Reading Instruction

Reading is a complex behavior and therefore it comes as no surprise that there have been multiple theories and approaches developed claiming to be the best approach to teaching reading. The two most prominent reading philosophies are phonics-based instruction and whole-language based instruction. The phonics-based approach focuses on teaching specific skills such as phonological awareness and letter-sound correspondence systematically through the use of direct instruction. As students progress, they learn to use these specific skills in combination in order identify new words. As a result, students are able to increase their reading comprehension as they are able to identify more of the words in the text and form a better understanding of what the reading is about.

The whole language approach focuses on teaching students to read whole words by helping them understand the context of their reading. This approach is more individualized than the phonics-based approach as teachers use a student's verbal language ability to develop a curriculum and select literature for the student to read. However, instruction within the whole language approach is mostly indirect as students learn by trial and error, first reading a text for meaning and then identifying unknown words by determining what words make sense given the context of the story.

Reading instruction in United States classrooms has swung back and forth between these two approaches over the past few decades (National Institute of Child Health and Human Development, 2000). In an attempt to identify the most effective reading instructional practices, Congress convened a panel of reading experts in 1997 to examine the available reading research. This panel, known as the National Reading Panel, published its findings in 2000 offering

significant support to the phonics-based approach to reading instruction. Despite the thorough nature of this report and its focus on scientifically-based research, disagreements regarding reading instruction and the use of the whole-language approach remain (Rigby, 2008). The whole language approach to reading instruction does have its benefits (Pressly, 2006; Stahl & Miller, 1989) and some have even advocated for reading instruction that incorporates the strengths of both philosophies (e.g., Pressley, 2006; Snow, Burns, & Griffin, 1998). However, the effectiveness of the phonics-based approach in helping students learn to read is clearly established within the National Reading Panel report.

Findings of the National Reading Panel

The National Reading Panel examined the reading research with a focus in the skill areas of phonemic awareness, phonics, fluency, vocabulary, and comprehension. These components and their integration are considered vitally important for students as they learn to read (Vaughn & Linan-Thompson, 2004).

Phonemic awareness. Phonemic awareness is the ability to recognize phonemes, the smallest units of sound within spoken language, and separate, blend, and manipulate these phonemes within words (Vaugh & Linan-Thompson, 2004). Phonemic awareness is considered one of the best predictors of early reading success and those students who struggle to learn phonemic awareness by the end of kindergarten are more likely to struggle with reading (National Reading Panel, 2000; Pressley, 2006). Phonemic awareness instruction is strongly supported within the research literature, as the National Reading Panel identified more than 52 peer-reviewed studies showing positive benefits for students when phonemic awareness was explicitly taught in combination with letter sounds. The benefits of phonemic awareness instruction are wide reaching, as it has been shown to help students with disabilities, students

from low socioeconomic groups, and ESL students (National Reading Panel). Additionally, the positive effects of phonemic awareness training are maintained across time, as increases in student abilities to read and decode novel words have been noted (National Reading Panel).

Phonics. Phonics is the ability to link letters and letter combinations with sounds (Vaughn & Linan-Thompson, 2004). The goal of phonics instruction is to teach the relationships between letters and sounds in order to enhance students' ability to identify unknown words by sounding them out (National Reading Panel, 2000). The findings of the National Reading Panel indicated that explicit and systematic phonics instruction improved the word recognition, spelling, and reading comprehension of students and was superior to unsystematic phonics instruction or no phonics instruction at all. The National Reading Panel findings also emphasized early phonics instruction, as phonics instruction in kindergarten and first grade was more effective than phonics instruction starting thereafter. Phonics instruction was also found to have a positive effect on the ability to decode unknown words for students struggling with reading (National Reading Panel).

Fluency. Fluency is the ability to read quickly and accurately and serves as an important link between word decoding and reading comprehension. Those students who fail to develop fluency, read slowly as they struggle to decode words, and as a result they are unlikely to comprehend the information they have read (Vaughn & Linan-Thompson, 2004). The National Reading Panel (2000) reported significant support for the practice of repeated reading for improving fluency. However key elements need to be present when engaging in repeated reading (Vaughn & Linan-Thompson). First off, explicit instruction needs to occur during repeated reading, as there is no evidence that simply having students engage in independent reading improves fluency (National Reading Panel). Therefore, students should have fluent

reading modeled for them, be given multiple opportunities to read the same text with corrective feedback, and performance criteria should be set for the speed and accuracy of reading (Vaughn & Linan-Thompson).

Vocabulary. Vocabulary instruction involves teaching the meanings of words. Having a strong vocabulary is important, as knowing the meanings of words helps make sense of what is read (Vaughn & Linan-Thompson, 2004). The National Reading Panel (2000) concluded that explicit vocabulary instruction improves reading comprehension. Key instruction practices to improve a student's vocabulary include systematically teaching vocabulary words and their meanings, providing opportunities to practice using vocabulary words, including vocabulary instruction on a consistent basis, and engaging in reading (Vaughn & Linan-Thompson).

Comprehension. Reading comprehension is the ability to understand what you have read. It is generally considered a dynamic process requiring the use of prior knowledge in order to understand vocabulary and concepts, link key information, and make inferences (Vaughn & Linan-Thompson, 2004). It is the ultimate goal of the reading process and allows independent learning to occur throughout life. Vaughn and Linan-Thompson point out that too often instruction in reading comprehension is overlooked. Simply asking students to answer questions after reading does not teach students how to comprehend what they have read. Fortunately, the findings of the National Reading Panel (2000) revealed multiple researched-based strategies for improving reading comprehension. These strategies include the use of graphic and semantic organizers, comprehension monitoring, question answering, question generation, the use of story structure, and summarizing important ideas.

Chall's Model of Reading Development

The development of proficient reading is a complex process and many theories have been proposed over the years attempting to explain how proficient reading occurs. At this time, there is not one comprehensive theory, but one of the most well regarded and frequently sited models of reading development was proposed by Jeanne Chall.

Chall (1996) presented a model of reading development that begins with a description of how students learn early literacy skills (e.g., decoding and alphabetic principle) and proceeds to explain how comprehension is tied into the development of reading. Chall's model consists of six stages, Stage 0 – Stage 5. These stages are not distinct stages, however, as students my demonstrate skills across multiple stages at one time.

The first stage of Chall's model, Stage 0, is known as the Pre-alphabetic or Pre-reading Stage and occurs from birth to about six years of age. During this stage students are learning the very basics of reading such as how to interact with a book and the idea that print conveys meaning. At this stage, Chall recommends that students be taught phonemic awareness and letter names.

The second stage, Stage 1, is known as the Initial Reading Stage and occurs from kindergarten to the beginning of second grade. During this time, Chall indicates that instruction should focus on teaching letter-sound correspondence, decoding skills, and common sight words.

Stage 2, the third stage of Chall's model, referred to as the Confirmation and Fluency Stage, occurs during second and third grades. Students at this stage no longer need to be explicitly taught each individual word, but can instead decode and self-teach words. During this stage, it is recommended that instruction focus on increasing reading fluency as increased fluency allows for better reading comprehension (LaBerge & Samuels, 1974). Additionally, at

this stage it is imperative that students are encouraged to read frequently in order to increase word recognition skills. Stanovich (1986) reported what he termed the Matthew Effect in which students who struggle to read tend to avoid reading and as a result fail to develop their general word knowledge and vocabulary, thereby increasing the gap between good and poor readers.

The fourth stage of Chall's model, Stage 3, referred to as the Reading to Learn Stage occurs between fourth and eighth grade. During this time, the focus of reading instruction shifts from learning to read to reading to learn. Students are expected to have mastered decoding skills and now are supposed to read text for the purpose of gaining knowledge. Texts read during this stage tend to present straightforward facts from a single perspective due to the cognitive development and lack of experience gleaning information from print of students at this stage.

The fifth stage, Stage 4, is the Multiple Viewpoints Stage. This stage typically occurs as students enter into high school. Students at this stage are expected to critically evaluate information from differing viewpoints and form their own opinions. Higher order thinking skills are important here as students must evaluate their understanding of what they are reading. Poor readers are unlikely to be successful at this stage, as they struggle with decoding and fluency development and as a result comprehend only some of what they read.

The sixth and final stage of Chall's model, Stage 5, is referred to as the Construction and Reconstruction Stage. This stage typically develops during college when students develop a wealth of knowledge in specific content areas and become critical readers of information on those topics. In this stage, students need to combine information from various sources, develop their own meaning from the information, and then verify that meaning through further reading.

Matching Reading Assessment Data to Reading Interventions

Despite the extensive amounts of time and effort put into the research, development, and implementation of effective reading instruction, there continues to be students who struggle with learning the necessary skills of reading within the general education setting. Therefore, the development of effective reading interventions for these struggling students is a necessity. Perhaps just as important as the development of effective reading interventions is the matching of these interventions to students based on their specific reading needs. This concept of matching assessment data to specific interventions in the area of reading has been developed and expanded upon by many over the years.

Instructional Hierarchy. One approach to linking assessment data to academic interventions is the instructional hierarchy developed by Haring, Lovitt, Eaton, and Hansen (1978). The instructional hierarchy presents a four stage model of teaching and learning academic skills. The model proposes that the learning of academic skills occurs through four stages and that different instructional methods are most effective for promoting development within each stage.

The first stage of Haring et al.'s (1978) instructional hierarchy is acquisition which occurs when students first begin to learn a skill. The focus during the acquisition stage is accuracy. Initially students will struggle to demonstrate the desired skill consistently and teachers should focus on modeling, prompting, and error correction procedures to increase the likelihood that the students will accurately preform the skill. For example, if a student misreads a vocabulary word, the teacher could model the correct reading of the word or provide prompts to the student such as the initial sound of the word, increasing the probability that the student will correctly read the word following the teacher feedback.

The second stage in the hierarchy, fluency, occurs when students are able to accurately preform a skill, but the accurate response requires an excessive amount of time and effort from the student. The focus during the fluency stage is maintaining a high level of accuracy, but increasing the speed in which the student is able to demonstrate the skill. During this stage, teachers should provide drill and practice opportunities under timed conditions in order to develop a student's ability to perform the skill efficiently. For example, students may be required to read the same reading passage multiple times with a focus on accurate and efficient reading. Corrective feedback may still be provided to the student, but after the completion of the drill and practice exercises since the focus is on building fluency (Daly, Chafouleas, & Skinner, 2005).

The third stage, generalization, occurs when students learn to demonstrate the skill across different settings and contexts. Haring et al. (1978) identified that generalization was likely not a completely separate stage, but as identified by Stokes and Baer (1977) the generalization of skills should not be assumed. Therefore, generalization should be integrated into the learning and teaching process. The work by Daly et al. (2005) encourages the integration of generalization within both the acquisition and fluency stages of the instructional hierarchy. Generalization can be facilitated by teaching skills in various contexts and settings such as having students learn new vocabulary words from a list or by reading sentences or by incorporating vocabulary words across academic content areas.

The final stage of the instructional hierarchy is adaptation. Adaptation involves learning to modify skills to meet the challenges of novel situations. Teachers can help students within this phase by providing them with multiple opportunities to apply a learned skill to novel task demands.

Burns, Riley-Tillman, & VanDerHeyden's RTI Applications. The instructional hierarchy has been used by multiple researchers to match reading assessment data to interventions (Burns, Riley-Tillman, & VanDerHeyden, 2012; Daly, Lentz, & Boyer, 1996; Howell & Nolet, 1999). Burns et al. in the book titled *RIT Applications: Academic and Behavioral Interventions* delineates a process for using the instructional hierarchy to match student data to appropriate interventions for both academic and behavior problems.

According to Burns et al. (2012), the first step is to determine a student's proficiency in demonstrating the desired skill through the use of a survey-level assessment. A survey-level assessment involves taking a broad look at a student's performance in order to find the student's optimal instructional level (Hosp et al., 2007). This step is vital to matching the student's performance to the appropriate type of intervention indicated by the instructional hierarchy as it will provide information related the student's ability to demonstrate the skill accurately and fluently and indicate if there are prerequisite skills missing (Burns et al.).

A survey-level assessment in reading would include administering three separate reading passages at the student's current grade level according the CBM procedures and determining the median number of words read correct per minute and the median number of errors. The student's scores would then be compared to performance criteria for that grade level in order to determine if the student is performing within the instructional range. If the student's median number of words read correct per minute or median number of errors fail to fall within the instructional range three reading passages from the next lowest grade would be administered. This process would continue until the optimal instructional level is determined by comparing the student's scores to performance criteria for each grade level.

The second step according to Burns et al. (2012) is to use a functional academic assessment to determine the type of intervention that is most likely to be effective for the student. A functional academic assessment is similar to a functional analysis of behavior in that single-case experimental design elements are used to track the effective that manipulating antecedents and consequences has on the target behavior (Daly, Persampieri, McCurdy, & Gortmaker, 2005). For example, a student who is struggling to read fluently at grade level would have various evidence-based reading fluency interventions implemented within a short amount of time to determine which fluency intervention results in the largest increase in reading fluency rate for that student. This concept of functional academic assessment has been applied to multiple academic areas, produces reliable results, and leads to meaningful improvements in student performance (Daly et al.).

Howell & Nolet's Curriculum-Based Evaluation. Howell and Nolet (1999) also make use of the instructional hierarchy in their decision-making framework for linking reading assessment data to interventions. The decision-making framework laid out by Howell and Nolet is very detailed and outlines a series of decisions to be made based on survey level and specific level assessment results. The survey level assessments gather information on a wide range of academic skills, while specific level assessments focus on a narrow range of variables thought to contribute to the problem.

In the area of decoding, Howell and Nolet (1999) lay out a detailed instructional decision making framework which consists of the use of one survey-level assessment, several specific-level assessments, and teaching recommendations. The survey-level assessment involves gathering information regarding the classroom reading instruction provided, the curriculum used, the student's response to classroom instruction, and curriculum-based measurement of the

student's oral reading skills. This survey-level assessment information is then used to guide the assessment to more specific areas of concern and the corresponding specific-level assessments. These specific areas of concern include poor knowledge of early reading skills, reading accurately but slowly due to lack of reading experience, reading slowly and inaccurate due to poor decoding skills, poor decoding skills due to lack of self-monitoring and effort, predictable error patterns, and poor development of phonics. Once the specific areas of concern have been assessed the assessment is data is linked with specific teaching recommendations.

In the area of reading comprehension, Howell and Nolet (1999) also lay out a separate detailed instructional decision making framework. Reading comprehension is characterized by Howell and Nolet as a process of actively searching for meaning in what is read. They propose that in order to effectively comprehend, an individual must exhibit both comprehension strategies as well as enabling skills. The enabling skills consist of the ability to decode, knowledge of vocabulary and syntax, and prior knowledge regarding the topic of the reading passage. Howell and Nolet point out that when these enabling skills are missing reading comprehension is not likely to occur and that even if these skills are present reading comprehension is not guaranteed. Therefore, although these enabling skills are prerequisite to effective comprehension an individual must also master what Howell and Nolet term comprehension strategies which consist of monitoring for meaning, selective attention to text, adjusting for task difficulty, connecting text to prior knowledge, and clarifying. In their book *Curriculum-Based Evaluation*, Howell and Nolet lay out assessment activities for each of the enabling skills and comprehension strategies and link the assessment results to specific interventions.

Shapiro's Academic Skills Problems. Shapiro (2004) also lays out a frame work for matching students' reading skills deficits to interventions in his book titled *Academic Skills Problems*. Shapiro emphasizes assessing the academic environment, assessing instructional placement, and modifying student instruction based on the collection of curriculum-based assessment (CBA) data.

Assessing the academic environment. Shapiro (2004) points out that the academic environment is important to assess when there is an academic problem, as environmental factors such as instructional presentation, feedback, and classroom structure can affect student responding. Therefore, Shapiro recommends using assessment procedures such as interviews, direct observations, examination of permanent products, and rating scales to help identify events within the instructional environment that may be contributing to the students' academic problems.

Assessing the instructional placement. After examining the academic environment Shapiro (2004) recommends directly assessing the reading skills of struggling students through the use of curriculum-based assessment. The type of curriculum-based assessment used may vary depending on the students' skill levels and areas of concern. For reading, in most cases students will likely complete a curriculum-based assessment focused on measuring oral reading fluency, but some students may also complete curriculum-based assessments measuring things such as phonemic awareness or phoneme segmentation.

The curriculum-based assessment should follow the procedure of a survey-level assessment according to Shapiro (2004), in which students are administered three separate reading passages at their grade level according to CBM procedures. The median number of words read correctly and median number of errors are then compared to performance criteria to

determine the students' instructional levels. This procedure is similar to the one previously discussed and advocated by Burns et al. (2012). However one area in which Shapiro differs from Burns et al. is in his recommendation for directly assessing reading comprehension. Shapiro advocates directly assessing a student's reading comprehension as part of the survey level assessment. In order to do this one of the three reading passages are randomly selected. This reading passage is administered according to the same standardized CBM procedures, as the evaluator will record the number of words read correctly in one minute, as well as the number of decoding errors made. However, after the minute has expired the evaluator has the student finish reading the entire reading passage and then asks the student a series of comprehension questions. Shapiro does not provide performance criteria on which to base instructional decisions for students who struggle to answer the reading comprehension questions, but he does note that a full reading comprehension assessment may be needed for some students. However, Shapiro indicates that for students who are struggling with reading comprehension and demonstrate poor reading fluency rates, reading fluency should be addressed through intervention prior to focusing solely on reading comprehension.

Instructional Modification. Once the students reading skills deficits and instructional levels have been identified they should be matched to research-based reading interventions based on this information (Shapiro, 2004). For those students who are struggling with prereading skills such as letter recognition, letter-sound correspondence, and phonemic awareness, research-based programs focused on teaching these skills should be used. As noted by Shapiro, there are many curricula available for use in effectively teaching these prereading skills, but it is important that these curricula follow a progression from easier to more difficult skills.

For those students who have developed basic reading skills, but are not reading fluently at grade level, Shapiro (2004) points out that these students need frequent opportunities to read while receiving corrective feedback. Shapiro indicated that these reading opportunities should be roughly 15-20 minutes and should occur multiple times per day. Research-based interventions focused on improving reading fluency identified by Shapiro include previewing reading material and drill and practice of vocabulary words.

For students who have learned basic reading skills and have learned to read fluently at grade level, but are struggling to comprehend what they read, Shapiro (2004) recommends teaching prereading and postreading comprehension strategies. Prereading strategies include providing students with specific questions or organizational templates to complete while they read. While postreading techniques include having students answer questions such as identifying the main idea or requiring students to retell what they read in their own words and then providing feedback based on their responses.

The 4-Box Instructional Decision Making Model. The 4-Box instructional decision making model developed by Harkin in 2008 is a framework for making instructional decisions for struggling readers, and the independent variable of this study. The 4-Box Instructional Decision Making Model is similar to the instructional decision making models previously discussed in many ways. First of all, it emphasizes the five key elements of reading instruction (phonemic awareness, phonics, fluency, vocabulary, and comprehension) identified by the National Reading Panel as vital to successful reading. Secondly, it follows widely accepted theory of reading development, emphasizing the mastery of early reading skills such as decoding prior to focusing on more advanced skills such as reading fluency and comprehension. The 4-Box Instructional Decision Making Model also follows the logic of the instructional hierarchy

(Haring et al.'s, 1978) by first emphasizing the accuracy of reading, next emphasizing reading fluency, and finally emphasizing reading comprehension. The recommended reading interventions of the 4-Box Instructional Decision Making Model are also based on the instructional hierarchy and corresponding research using its theory of skill development (Daly et al., 1996). Finally, the 4-Box Instructional Decision Making Model is similar in that it employs the use of curriculum-based measurement techniques to gather student reading data and make comparisons to performance criteria to determine instructional levels and areas of reading skill deficit.

The 4-Box Instructional Decision Making Model is different from the previously discussed instructional decision making models in many ways as well. First of all, the 4-Box Instructional Decision Making Model is concise and easily interpreted. The 4-Box Instructional Decision Making Model is a total of one page and addresses only reading, while the previously discussed models of instructional decision making are presented within books, are multiple chapters long, and address multiple academic skills and behaviors. It is reasonable to assume that as teachers struggle to find time to meet the various instructional needs of their students a straightforward and concise model of instructional decision making is more likely to be implemented than longer more complicated models. Secondly, the 4-Box Instructional Decision Making Model provides guidance on the type of progress monitoring that should occur, the frequency of that progress monitoring, and when students should be moved to the next type of intervention or exited from the intervention program all together. Finally, the 4-Box Instructional Decision Making Model provides guidance for those readers who read fluently but are inaccurate in their reading. These types of readers are addressed in Howell and Nolet's instructional decision making model, but not the models of Shapiro (2004) or Burns et al. (2012).

It is important that these student are specifically addressed through intervention as their reading difficulties are unique.

Performance Criteria. The performance criteria used within the 4-Box Instructional Decision Making Model to determine a student's need of reading intervention will vary depend on the skill being measured. In the area of reading fluency, performance criteria will be based on locally developed benchmarks which predict proficiency on the Minnesota Comprehensive Assessment in the area of reading. Students who have a less than 25% chance of being proficient on the Minnesota Comprehensive Assessment in the area of reading, based on the number of words read correctly per minute, will be considered in need of additional reading intervention. This approach to determining cut-offs for students in need of reading intervention is preferred to another commonly used approach in which students below the 25th percentile of a normative sample are considered in need of intervention (Burns et al. 2012) . The problem with the norm-referenced approach is the variability that exists in oral reading fluency performance across settings. Therefore, students performing at the 25th percentile or above in one setting may not be ready to advance to the next level of reading instruction, while students in another setting who are scoring below the 25th percentile may demonstrate the skills to advance in their reading instruction.

The performance criteria for accuracy of a student's reading will be set at 95%. Therefore, students who are failing to correctly read 95% of the words they are presented in a reading passage will be considered below target level and in need of additional reading intervention. The performance criteria of having students correctly read 95% of the words in grade level reading passages prior to building reading fluency is well supported within the

literature (Burns, 2007; Gickling & Armstrong, 1978; Gickling & Thompson, 1985; Treptow et al., 2007).

Performance criteria in the area of reading comprehension is not currently available within the research literature. Some have argued that assessing reading comprehension is unnecessary given the high correlation between reading fluency and comprehension (Hamilton & Shinn, 2003). However, as Shapiro (2004) points out, the possibility that "word callers," students who are proficient in decoding and reading fluency but struggle to comprehend what they read, exist even if in only a few cases, makes the direct assessment of reading comprehension important. Therefore, when students are proficient at grade level in the areas of decoding and reading fluency, yet teachers and other assessments are indicating a concern regarding their reading performance a reading comprehension assessment should be completed. The reading comprehension assessment to be used within the 4-Box Instructional Decision Making Model was developed by Shapiro (2004) and involves having students read a short grade level passage in its entirety and retell the story. The student is then given a point for including specific aspects of the story (e.g., main idea, setting, main characters, events, problem and resolution to the problem) in his/her retelling of the story. Shapiro (2004) does not provide a cut score for determining when students who use this story retell assessment are proficient in reading comprehension. For the purpose of this study, students who are able to include 90% of these aspects in their story retell will be considered proficient in reading comprehension. The cut point of 90% is based on research by Burns (2004) which determined that 90% accuracy is desired for most academic tasks.

<table>
<tr>
<td>Quadrant 1: Accurate and Fluent
_____% _____wcpm
Question: Are student's comprehension and vocabulary skills on grade level?

If yes, continue to provide strong initial instruction (core).

If no, build comprehension and/or vocabulary skills.

Plan of Action:
• Work on monitoring for meaning
• Work on identifying main ideas
• Instruction in self-monitoring and fix-up strategies and awareness of reading for understanding
• Teach important words directly and word-learning strategies
Monitoring: Class-wide assessments, retell, strategy use, vocabulary knowledge rating scale

Exit criteria: Proficient on district-wide assessments and demonstrates grade level knowledge of vocabulary and comprehension.</td>
<td>Quadrant 2 : Accurate and Slow
_____% _____wcpm
Plan of Action:
• Work on automaticity, but do not ignore making meaning.
• Repeated readings
• May need to do automaticity work at the word or phrase level in addition to passages
• Work on grouping words to make meaning, pacing punctuation
• Use narrative and informational texts
• Read for main idea, summary, or elements

Monitoring: Oral reading fluency at least once a week - graph both accuracy and fluency

Exit Criteria: Oral reading fluency benchmark range for grade and time of year and/or proficient on district-wide assessments, and demonstrates grade level knowledge of vocabulary and comprehension.</td>
</tr>
<tr>
<td>Quadrant 3: Inaccurate and Slow
_____% _____wcpm
Plan of Action:
• Work on missing decoding skills
• Work on missing sight words skills
• Work on applying skills to connected text at instructional level
• Work on fluency at independent level

Monitoring: Oral reading fluency at least once a week - graph both accuracy and fluency, expect a change in accuracy before fluency.

Exit Criteria: Oral reading fluency score shows movement into Quadrant 1 or 2 and/or proficient on district-wide assessments and demonstrates grade level knowledge of vocabulary and comprehension.</td>
<td>Quadrant 4: Inaccurate and Fluent
_____% _____wcpm
Plan of Action:
• Table tap when student makes and error. This will help the student slow down and read more accurately.
• Challenge student to read a portion of the text with 2 or less errors
• Teach student to adjust rate of reading to type of text and purpose for reading
Monitoring: Oral reading fluency at least once a week - graph both accuracy and fluency- looking for a change in accuracy.

Exit Criteria: Oral reading accuracy score shows movement into range for Quadrant 1 and/or proficient on district-wide assessments and demonstrates grade level knowledge of vocabulary and comprehension</td>
</tr>
</table>

Quadrant 1. Students classified into quadrant 1 are those students often referred to in the literature as "word callers." These students are meeting grade level reading benchmarks for fluency and are at or above 95% accuracy in decoding, but continue to struggle on reading assessments. At this point, it needs to be determined if the students' reading comprehension and vocabulary skills are at grade level. If reading comprehension and vocabulary skills are at grade level the student does not require a reading intervention, but should continue to receive quality core reading instruction. However, if it is determined that the student struggles with reading comprehension and/or vocabulary skills an intervention should be developed and implemented.

The intervention for this group of students should focus on teaching students how to monitor for meaning while reading and how to identify main ideas. The intervention should also include direct instruction on self-monitoring and fix-up strategies and the teaching of important words and word-learning strategies.

Students in quadrant 1 should be progress monitored by measuring their ability to retell what they have read, the proficiency in which they are able to use reading comprehension and word-learning strategies, and by using a vocabulary knowledge rating scale. Students should continue to receive this intervention until they are proficient on state-wide assessments and demonstrate grade level knowledge of vocabulary and comprehension.

Quadrant 2. Quadrant 2 consists of those students who are accurate, but slow readers. In other words, these students are able to read at least 95% of words correctly, but are not meeting reading fluency performance standards for their grade level. Therefore, these students should receive an intervention focused on building reading fluency. However, it is important that reading comprehension is not ignored at this time and that students are still able to identify main ideas and summarize what they have read.

Progress monitoring should be completed in quadrant 2 by measuring the student's oral reading fluency at least once a week, graphing for both fluency and accuracy. The student remains in quadrant 2 until oral reading fluency is within the performance criterion range for their grade and time of year. Once this is achieved the student should proceed to quadrant 1 where it should be determined if the student's reading comprehension and vocabulary skills are on grade level.

Quadrant 3. Students classified into quadrant 3 are those students who are inaccurate and slow readers. These students are not meeting grade level performance criterion for reading fluency and are below 95% accuracy. Because these students are inaccurate readers they need an intervention focused on teaching decoding skills and sight words, as well as being taught to apply these skills to connected text. Students in quadrant 3 should be progress monitored once a week graphing for both accuracy and fluency, with an expectation that reading accuracy will improve before reading fluency. Students remain in quadrant 3 until their oral reading fluency score indicates that they have progressed into quadrant 1 or 2 or they no long demonstrate the need for reading intervention at any level.

Quadrant 4. Quadrant 4 consists of students who are fluent, but inaccurate readers. These students are meeting grade level performance standards for reading fluency, but are reading below 95% accuracy. It is assumed that these students likely have the skills necessary to decode reading passages, but are not monitoring their own reading and therefore are not self-correcting when they make decoding errors (Howell & Nolet, 1999). As a result, these students need to be taught self-monitoring skills.

In order to teach self-monitoring skills the interventionist will tap on the table when the student makes an error and require the student to correct the decoding error causing the student

to slow down and read more accurately. Additionally, the student should be challenged to decrease the number of reading errors within reading passages and taught to adjust the rate of read according to the type of text and purpose for reading.

Progress monitoring for students in quadrant 4 should be conducted at least once per week monitoring for both accuracy and fluency, specifically looking for a change in accuracy. Once a student's accuracy score is at 95% on grade level reading passages the student progresses to quadrant 1 or is dismissed from the reading intervention if he/she is proficient on district-wide assessments and demonstrates grade level knowledge of vocabulary and comprehension.

Chapter III: Methods

Participants

The participants in this study were 7 elementary school students who were identified as struggling readers by their teachers and the scores they obtained on the school district's measures of reading achievement. For these seven students the screening measures included the curriculum-based measurement of oral reading fluency, performance on the Northwest Evaluation Association's Measures of Academic Progress, and performance on the Minnesota Comprehensive Assessment of Reading when applicable. Additional qualifications for participation in this study included being a native English speaker and not having a disability such as developmental cognitive disability or autism due to the possible impact that these conditions could have on learning reading skills.

Mary was an eleven year-old Caucasian fifth grade female. She had a history of meeting the school district's oral reading fluency target for the number of words read correct per minute, as well as consistently achieving at least 95% accuracy in her reading. Due to Mary's oral reading fluency performance, she had never been identified as being in need of a reading intervention. However, Mary failed to pass the Minnesota Comprehensive Assessment of Reading in fourth grade and her performance on the Northwest Evaluation Association's Measures of Academic Progress during the spring of 2013-14 placed her at the 27th percent with a RIT score of 198. Mary's RIT score of 198 corresponded to having a less than 25% chance of proficiency on the Minnesota Comprehensive Assessment of Reading.

John was an eleven year-old Caucasian fifth grade male. He also had a history of meeting the school district's oral reading fluency target for the number of words read correct per minute, as well as consistently achieving at least 95% accuracy in his reading. Due to his oral

reading fluency performance, he too had never been identified as being in need of a reading intervention. However, John failed to pass the Minnesota Comprehensive Assessment of Reading in fourth grade and his performance on the Northwest Evaluation Association's Measures of Academic Progress during the spring of 2013-14 placed him at the 30th percentile with a RIT score of 200. Jon's RIT score of 200 corresponded to having a less than 25% chance of proficiency on the Minnesota Comprehensive Assessment of Reading.

Emmitt and Vince were both seven year-old Caucasian second grade males. Both Emmitt and Vince had a history of not meeting the school district's oral reading fluency target for the number of words read correct, but were able to read with at least 95% accuracy.

Ben was also a seven year-old Caucasian second grade male. He however, had a history of not only not meeting the school district's oral reading fluency target for the number of words read correct per minute, but also read with less than 95% accuracy.

Holly was a seven year-old Caucasian second grade female. She was similar to Ben in that she also had a history of not meeting the school district's oral reading fluency target for the number of words read correct per minute, but also read with less than 95% accuracy.

Darrin was a seven year-old Caucasian second grade male. He had a history of reading struggles previously failing to meet the school district's oral reading fluency target for the number of words read correct per minute, as well as failing to meet the desired reading accuracy rate of 95%. However, Darrin's most recent oral reading fluency benchmark screening indicated that he was meeting the target for the number of words read correct per minute, but was falling short of the desired reading accuracy rate of 95% placing him into quadrant #4 for the purposes of this study.

Setting

This study was conducted in a small elementary school in rural Minnesota with roughly 25 students per grade level. All reading assessments and interventions were completed in a small room within the elementary school, which was already being used by the school for delivering academic interventions to small groups of students. The room consisted of a small table, chairs, and the necessary materials for providing academic interventions.

Procedure

School district reading benchmark assessments. The reading performance of all study participants was initially evaluated during the school district's oral reading fluency benchmark screening period in which all students participate. During this assessment participants were administered three separate reading passages at their current grade level according to the CBM procedures. The median number of words read correct per minute and accuracy rate were calculated and compared to performance criteria for that grade level.

For students in third through sixth grade, the Northwest Evaluation Association Measures of Academic Progress (NWEA MAP) was also administered to gather further information regarding student reading performance. The performance on the NWEA MAP test was also compared to performance criteria for that grade level.

After the completion of all reading benchmark assessments this data was analyzed. Depending on individual performance on reading benchmark assessments, classroom teacher confirmation of any reading difficulties identified, and parental consent to participate in the study the seven study participants were selected.

Record review. Five of the seven students participating in this study had previously participated in reading interventions chosen and implemented by their teachers in coordination

with the school's reading interventionists. During these interventions progress monitoring data was been collected using CBM oral reading fluency probes. This oral reading fluency data was collected from the school's data management system and used as a comparison for the intervention indicated by the 4-Box Instructional Decision Making Model.

Reading interventionist training. The reading interventionists for this study consisted of teachers who were currently working within the participating school to provide academic interventions to struggling students. Once reading assessment data was collected and the type of intervention was chosen through the use of the 4-Box Instructional Decision Making Model, the reading interventionists were trained to implement the identified intervention by the student researcher. In the training session, the student researcher used explanation, modeling, practice, and feedback to assure that the reading interventionists were able to do the intervention. A scripted protocol was also given to the reading interventionists that provided a step-by-step explanation of the reading intervention for each student.

Intervention. The reading interventionists provided the intervention indicated by the 4-Box Instructional Decision Making Model to the students five days a week for 20 minutes a day. During this intervention phase the students had their progress monitored weekly using an appropriate measure based on the student's reading needs. Students struggling with reading accuracy, reading fluency, or both were progress monitored using curriculum-based measures of oral reading fluency. Students struggling with reading comprehension were progress monitored using the MAZE curriculum-based measure.

Follow-up benchmark assessments. Following the completion of the reading intervention indicated by the 4-Box Instructional Decision Making Model additional reading assessment data was gathered through the school district's reading benchmark assessments. For

most participants this consisted of the curriculum-based measurement of oral reading fluency. However, for the two older students struggling with reading comprehension this consisted of the administration of the NWEA MAP test.

Treatment Integrity

Treatment integrity checks were completed once every two weeks. These checks consisted of the student researcher observing intervention sessions to be sure that the intervention steps of the scripted protocol were being completed in the specified order. Treatment integrity was then calculated by dividing the number of steps completed by the total number of steps on the scripted protocol to yield the percentage of steps completed for each session. Treatment integrity was calculated to be 97% across all participants throughout the length of the study.

Inter-rater Reliability

Inter-rater reliability checks were conducted once every two weeks during the students' weekly progress monitoring sessions. The progress monitoring results of the student researcher and the reading interventionist were compared and inter-rater agreement was calculated by dividing the number of agreements by the sum of agreements and disagreements. Inter-rater agreement was calculated to be 99% with only 6 disagreements across all participants throughout the length of the study.

Design/Data Analysis

A multiple base-line across participants design was used when possible to evaluate the effectiveness of the 4-Box Instructional Decision Making Model in improving student reading performance. However, a multiple base-line across participants design could not be used for

quadrant #4 of the 4-Box Decision Making Model, as only one student meet the criteria for quadrant #4.

The question being considered in this research was whether or not the 4-box Decision Making Model developed by Harken leads to more effective reading interventions for struggling readers. In order to answer this question the effectiveness of the students' previous reading intervention, when available, were compared to the intervention indicated by the 4-Box Instructional Decision Making Model. The effectiveness of these interventions were evaluated using the single-subject analysis technique called Improvement Rate Difference (IRD; Parker, Vannest, & Brown, 2009). An IRD score is similar to effect size, and ranges from 0 to 1. IRD is calculated by determining the difference between improvement rates for each experimental phase. The improvement rate for each phase is calculated by determining the number of "improved data points" divided by the total number of data points. In general, the higher the IRD score the more effective the intervention. However, when comparing two interventions, an IRD of 50% would be expected if there was no difference in effectiveness between the two interventions, as half of the scores between the two interventions are overlapping.

Chapter IV: Results

Quadrant #1 of the 4-Box Decision Making Model

The two students included in this study who fell into quadrant #1 of the 4-Box Decision Making Model, based on the results of their school's reading assessment data, were John and Mary. Both of these fifth grade students received an intervention focused on improving their reading comprehension (Appendix E), in particular their ability to identify the main idea of paragraphs as they read. The results of this intervention, indicated by the 4-Box Decision Making Model, are displayed, but comparison data from a previous teacher chosen intervention are not. Neither John or Mary were previously identified as being in need of a reading intervention prior to the use of the 4-Box Decision Making Model despite their failure to pass the Minnesota Comprehensive Assessment of Reading.

Mary's Intervention Results. The results of Mary's reading comprehension intervention, indicated by the 4-Box Instructional Decision Making Model, are displayed in Figure 1. Mary received a reading comprehension intervention focused on improving her ability to identify the main idea of each paragraph she read three days a week for 20 minutes. Special attention was given to Mary's ability to identify the main idea of non-fiction reading as this was her lowest score on the 2014-15 Fall Northwest Evaluation Associations Measure of Academic Progress test. Mary's progress was measured using the MAZE curriculum-based measurement tool and she demonstrated positive growth in her MAZE fluency over the intervention period as indicated by the trend line.

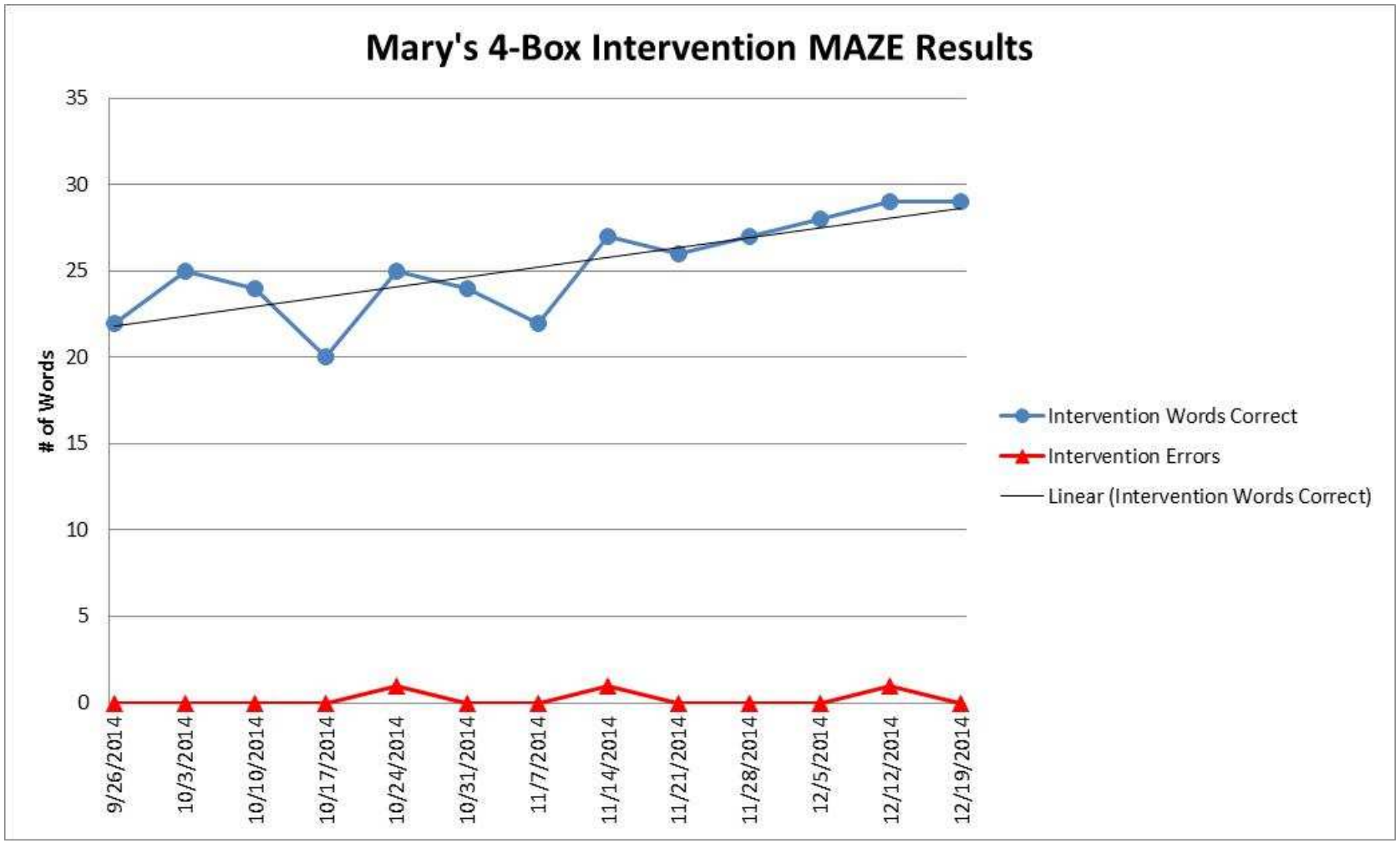

Figure 1. Results of Mary's 4-Box Intervention.

Table 1 displays Mary's scores on the Northwest Evaluation Association Measures of Academic Progress (MAP) test. The scores reported are from the 2014-15 fall assessment, prior to the reading comprehension intervention, and from the 2014-15 winter assessment following thirteen weeks of intervention. Mary was able to increase her overall MAP score by 10 points since the beginning of the school year. This amount of growth is noteworthy, as the expected rate of growth for fifth grade students scoring a 198 in the fall is 3 points. Additionally, Mary's winter 2014-15 MAP score of 208 indicates a higher likelihood of passing the Minnesota Comprehensive Assessment of Reading at the end of fifth grade. If Mary is able to gain at least one more point prior the administration of the Minnesota Comprehensive Assessment of Reading in the Spring of 2014-15, she will have increased her chance of proficiency on the Minnesota Comprehensive Assessment of Reading from less than 25% to between 25% and 75%.

Table 1

Results of Mary's Northwest Evaluation Associations Measures of Academic Progress Tests.

	Fall 2014-15		Winter 2014-15	
NWEA MAP Reading	198		208	
Literature	204	Average	208	Average
Informational Text	188	Low	208	Average
Foundations/Vocabulary	203	Average	208	Average

John's Intervention Results. The results of John's reading comprehension intervention, indicated by the 4-Box Decision Making Model, are displayed in Figure 2. John received a reading comprehension intervention focused on improving his ability to identify the main idea of each paragraph he read three days a week for 20 minutes. Special attention was given to John's ability to identify the main idea of non-fiction reading as this was his lowest score on the 2014-15 Fall Northwest Evaluation Associations Measure of Academic Progress test. John's progress was measured using the MAZE curriculum-based measurement tool. He demonstrated positive growth in his MAZE fluency over the intervention period as indicated by the trend line.

Table 2 displays John's scores on the Northwest Evaluation Association Measures of Academic Progress (MAP) test. The scores reported are from the 2014-15 fall assessment, prior to the reading comprehension intervention, and from the 2014-15 winter assessment following thirteen weeks of intervention. John was able to increase his overall MAP score by 11 points since the beginning of the school year. This amount of growth is noteworthy, as the expected rate of growth for fifth grade students scoring a 197 in the fall is 3 points. Additionally, John's winter 2014-15 MAP score of 208 indicates a higher likelihood of passing the Minnesota Comprehensive Assessment of Reading at the end of fifth grade. If he is able to gain at least one more point prior the administration of the Minnesota Comprehensive Assessment of Reading in the Spring of 2014-15, he will have increased his chance of proficiency on the Minnesota Comprehensive Assessment of Reading from less than 25% to between 25% and 75%.

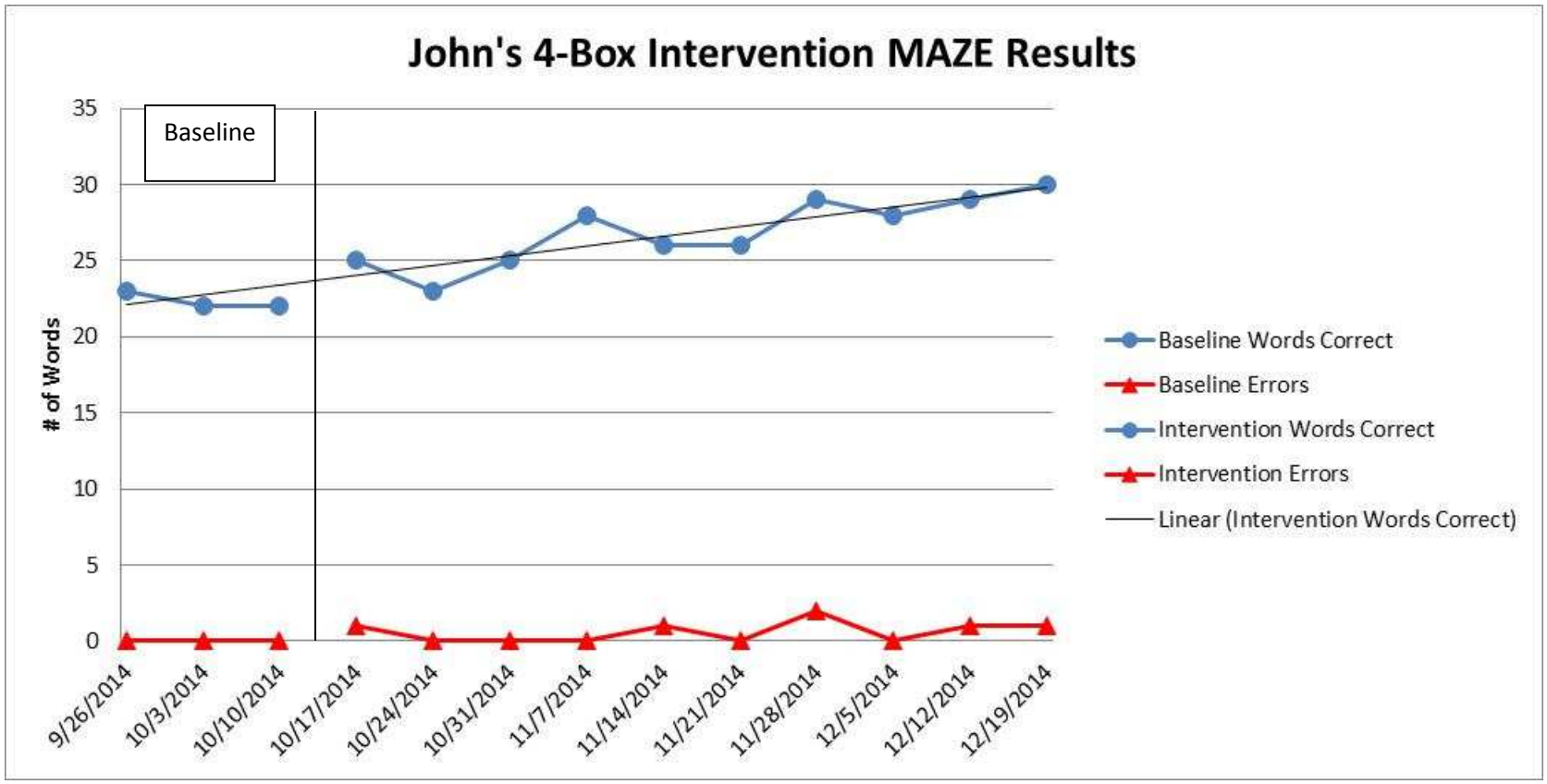

Figure 2. Results of John's 4-Box Intervention.

Table 2

Results of John's Northwest Evaluation Associations Measures of Academic Progress Tests.

	Fall 2014-15		Winter 2014-15	
MAP Reading	197		208	
Literature	197	Low	208	Average
Informational Text	196	Low	208	Average
Foundations/Vocabulary	199	Low	208	Average

Quadrant #2 of the 4-Box Decision Making Model

The two students included in this study who fell into quadrant #2 of the 4-Box Decision Making Model, based on the results of the 2014-15 fall oral reading fluency benchmark screening, were Emmitt and Vince. Both of these second grade students received a repeated reading intervention with comprehension strategy practice (Appendix F) focused on improving their reading fluency. The results of this intervention indicated by the 4-Box Instructional Decision Making Model are displayed, as well as the results of their previous reading intervention which was chosen by their teachers.

Emmitt's Intervention Results. The results of Emmitt's reading interventions are displayed in Figure 3 and Figure 4. Figure 3 shows the results of Emmitt's previous reading intervention which occurred during the second half of the 2013-14 school year and was chosen by his teachers. Emmitt was identified as a student in need of a reading intervention following the 2013-14 winter oral reading fluency benchmark screening which indicated that he was reading 22 words correct per minute with 92% accuracy. The target number of words read

correct for first graders at that time of year was 51 with 95% accuracy. As a result, Emmitt received a reading intervention chosen by his teachers which consisted of repeated practice of sight words using flash cards and taking turns reading with his teacher from a book at his reading level for 20 minutes five days a week.

The results of this intervention indicate that Emmitt steadily increased the number of words he was able to read per minute, as well as increased his reading accuracy. However, Emmitt's reading progress consistently fell below the aim-line indicative of being on track to meet his reading goal at the end of the school year. Emmitt needed to increase the number of words he read correct by 3.22 words per week to meet his end of the year reading goal and the intervention only resulted in an increase of 2.05 words per week. Also, during the 2013-14 spring oral reading fluency benchmark screening Emmitt failed to meet his reading goal. He read 59 words correct per minute with 98% accuracy, meeting his accuracy goal, but falling 21 words short of the spring benchmark target of 80 words correct per minute

Figure 4 shows the results of Emmitt's most recent reading intervention using the 4-Box Decision Making Model to guide the choice of reading intervention. Emmitt correctly read 55 words correct per minute with 98% accuracy during the 2014-15 fall oral reading fluency benchmark screening. The target number of words read correctly per minute for second grade students at that time of year is 71 with at least 95% accuracy. Emmitt met the reading accuracy goal, but fell short of the targeted number of words read correct per minute by 16 words, indicating a need for a fluency based intervention according to the 4-Box Decision Making Model. Emmitt received a repeated reading intervention that also included a reading comprehension component.

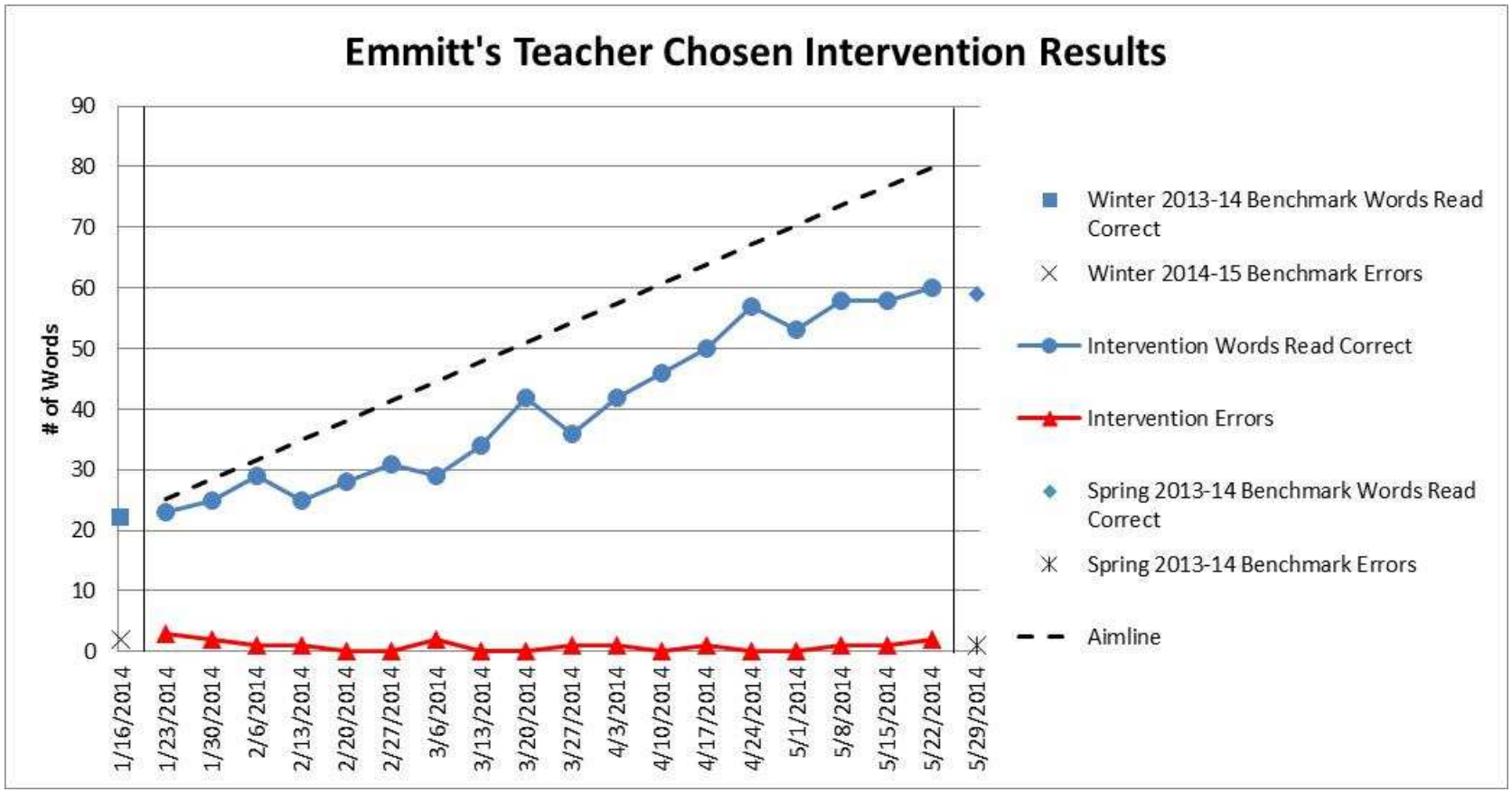

Figure 3. Results of Emmitt's Teacher Chosen Intervention

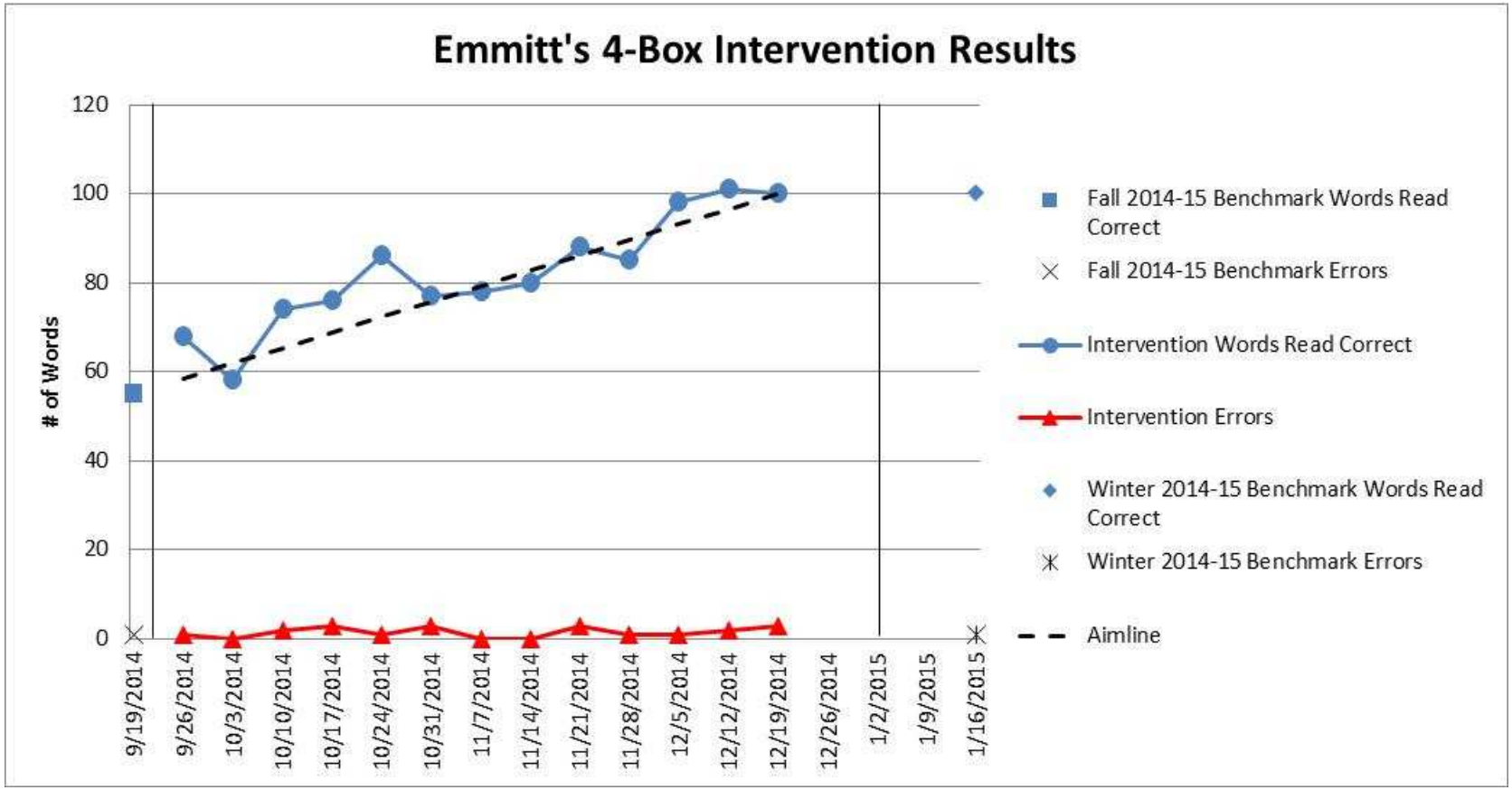

Figure 4. Results of Emmitt's 4-Box Intervention.

The results of this intervention indicate that Emmitt made consistent reading progress that exceeded or closely followed the aim-line indicative of meeting his reading goal of 100 words read correct per minute with at least 95% accuracy by the 2014-15 winter oral reading fluency benchmark screening. Emmitt needed to increase his number of words read correct per minute by 3.46 words per week to meet this goal which he did. The results of the 2014-15 winter oral reading fluency benchmark screening indicate that Emmitt correctly read 100 words per minute with 99% accuracy, meeting his reading goal and giving him at least a 75% chance of proficiency on the state reading test at the end of third grade.

A direct comparison of Emmitt's intervention indicated by the 4-Box Model with the previous teacher chosen intervention reveals greater reading success for him with the 4-Box Model intervention. He achieved a rate of increase of 3.46 words correct per minute each week with an average accuracy rate of 98% during the intervention indicated by the 4-Box Model. When he received the teacher chosen intervention he achieved a rate of increase of 2.06 words correct per minute each week with an average accuracy rate of 97%. Therefore, Emmitt gained 1.4 more words per week with a 1% increase in his reading accuracy when provided the intervention indicated by the 4-Box Model rather than the teacher chosen intervention. Additionally, the improvement rate difference, calculated based on the difference between the number of words read correct between the 4-Box Model intervention and teacher chosen intervention was 0.87 indicating a significant improvement in Emmitt's reading when provided the intervention indicated by the 4-Box Model.

Vince's Intervention Results. The results of Vince's reading interventions are displayed in Figure 5 and Figure 6. Figure 5 shows the results of Vince's previous reading intervention that occurred during the second half of the 2013-14 school year and was chosen by his teachers.

Vince was identified as a student in need of a reading intervention following the 2013-14 winter oral reading fluency benchmark screening which indicated that he was reading 19 words correct per minute with 86% accuracy. The target number of words read correct for first graders at that time of year is 51 with 95% accuracy. As a result, Vince received a reading intervention chosen by his teachers which consisted of repeated practice of sight words using flash cards and taking turns reading with his teacher from a book at his reading level for 20 minutes five days per week.

The results of this intervention indicate that Vince steadily increased the number of words he was able to read per minute, as well as increased his reading accuracy. However, Vince's reading progress consistently fell below the aim-line indicative of being on track to meet his reading goal at the end of the school year. Vince needed to increase the number of words he read correct by 3.39 words per week to meet his end of the year reading goal and the intervention only resulted in an increase of 1.72 words per week. Also, during the 2013-14 spring oral reading fluency benchmark screening Vince failed to meet his reading goal. He read 50 words correct per minute with 100% accuracy, meeting his accuracy goal, but falling 30 words short of the spring benchmark target of 80 words correct per minute.

Figure 6 shows the results of Vince's most recent reading intervention using the 4-Box Decision Making Model to guide the choice of reading intervention. Vince correctly read 55 words correct per minute with 98% accuracy during the 2014-15 fall oral reading fluency benchmark screening. The target number of words read correctly per minute for second grade students at that time of year is 71 with at least 95% accuracy.

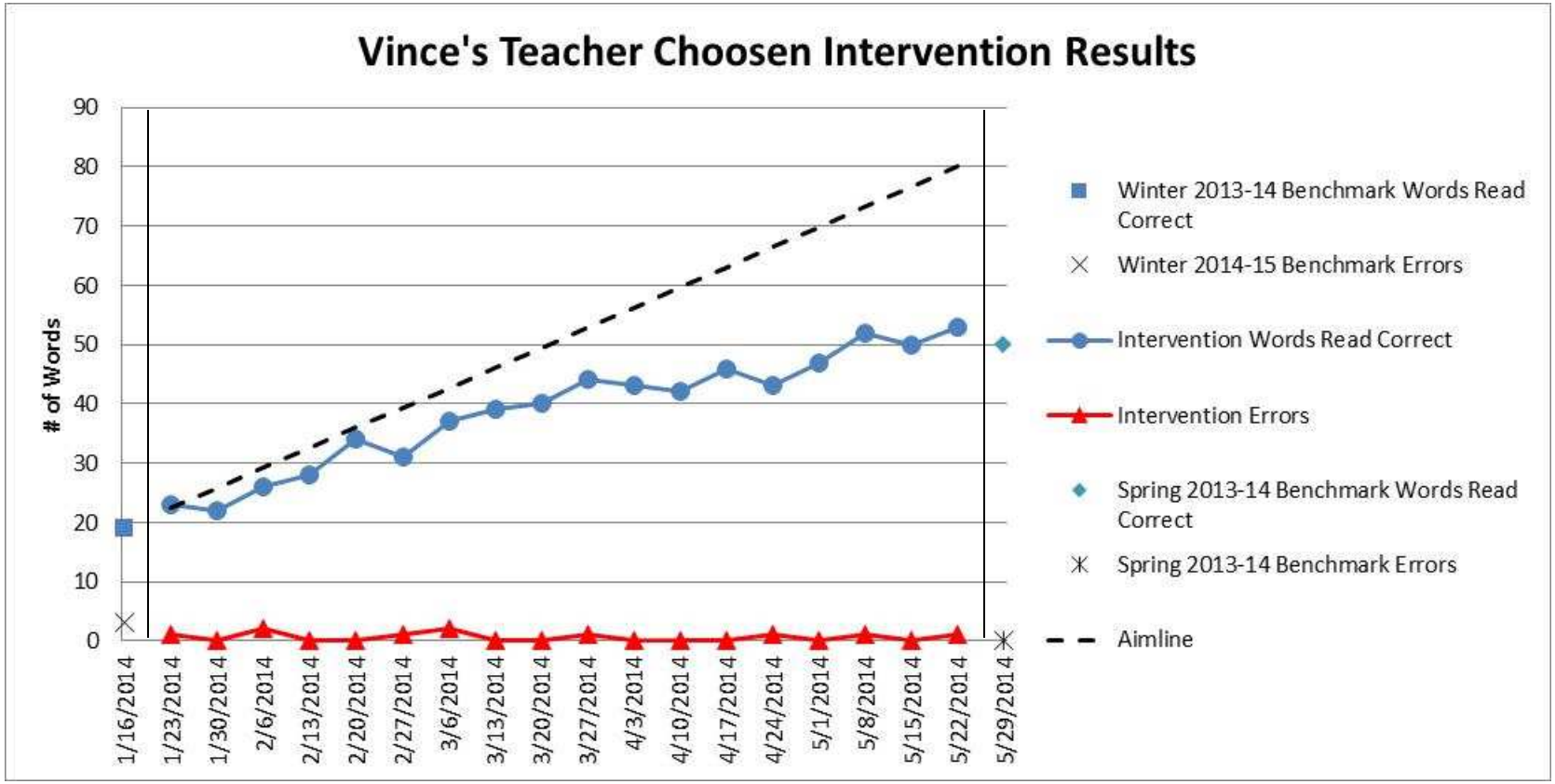

Figure 5. Results of Vince's Teacher Chosen Intervention.

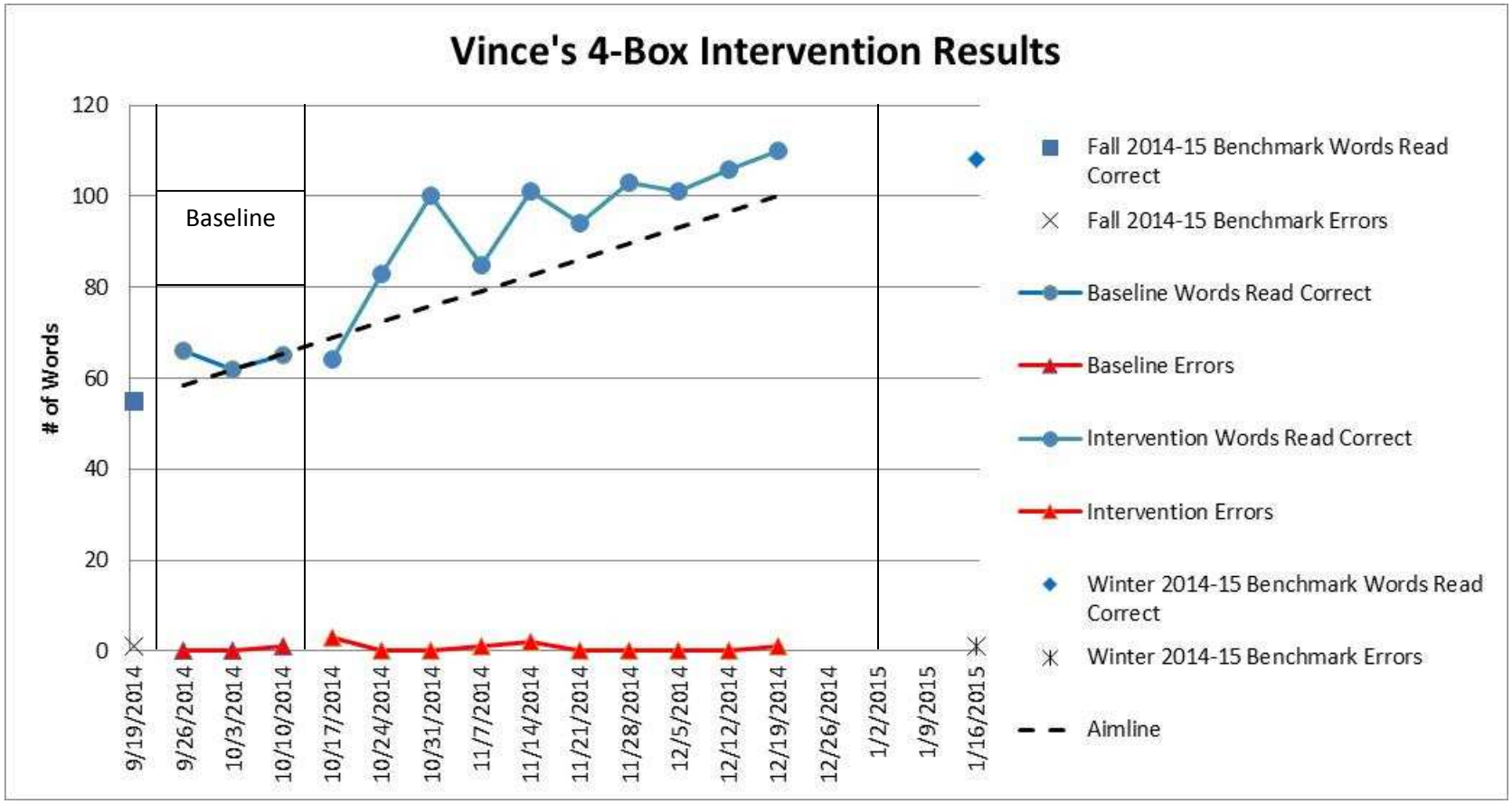

Figure 6. Results of Vince's 4-Box Intervention.

Vince met the reading accuracy goal, but fell short of the targeted number of words read correct per minute by 16 words, indicating a need for a fluency based intervention according to the 4-Box Decision Making Model. Vince received a repeated reading intervention that also included a reading comprehension component for 20 minutes five days a week.

The results of this intervention indicate that Vince made consistent reading progress in which the majority of his data points exceeded the aim-line indicative of meeting his reading goal of 100 words read correct per minute with at least 95% accuracy by the 2014-15 winter oral reading fluency benchmark screening. Vince needed to increase his number of words read correct per minute by 3.46 words per week to meet this goal which he did, increasing his words read correct per minute by an average of 4.08 words per week. Additionally, the results of the 2014-15 winter oral reading fluency benchmark screening indicated that Vince correctly read 108 words per minute with 99% accuracy, meeting his reading goal.

A direct comparison of Vince's intervention indicated by the 4-Box Model with the previous teacher chosen intervention reveals greater reading success for him with the 4-Box Model intervention. He achieved a rate of increase of 4.08 words correct per minute each week with an average accuracy rate of 99% during the intervention indicated by the 4-Box Model. When he received the teacher chosen intervention he achieved a rate of increase of 1.72 words correct per minute each week with an average accuracy rate of 98%. Therefore, Vince gained 2.36 more words per week with a 1% increase in his reading accuracy when provided the intervention indicated by the 4-Box Model rather than the teacher chosen intervention. Additionally, the improvement rate difference, calculated based on the difference between the number of words read correct between the 4-Box Model intervention and teacher chosen

intervention was 1.00 indicating a significant improvement in Vince's reading when provided the intervention indicated by the 4-Box Model.

Quadrant #3 of the 4-Box Decision Making Model

The two students included in this study who fell into quadrant #3 of the 4-Box Decision Making Model, based on the results of the 2014-15 fall oral reading fluency benchmark screening, were Ben and Holly. Both of these second grade students received a reading intervention focused on improving their ability to decode words (Appendix G). The results of these interventions indicated by the 4-Box Decision Making Model are displayed, as well as the results of their previous reading intervention which were chosen by their teachers.

Ben's Intervention Results. The results of Ben's reading interventions are displayed in Figure 7 and Figure 8. Figure 7 shows the results of Ben's previous reading intervention which occurred during the second half of the 2013-14 school year and was chosen by his teachers. Ben was identified as a student in need of a reading intervention following the 2013-14 winter oral reading fluency benchmark screening which indicated that he was reading 16 words correct per minute with 84% accuracy. The target number of words read correct for first graders at that time of year was 51 with 95% accuracy.

As a result, Ben received a reading intervention chosen by his teachers which consisted of repeated practice of sight words using flash cards and taking turns reading with his teacher from a book at his reading level for 20 minutes five days per week. The results of this intervention indicated that Ben slowly increased the number of words he was able to read per minute. However, Ben's reading progress fell below the aim-line indicative of being on track to meet his reading goal at the end of the school year and he continued to make frequent errors in his reading, failing to achieve the desired accuracy rate of 95%.

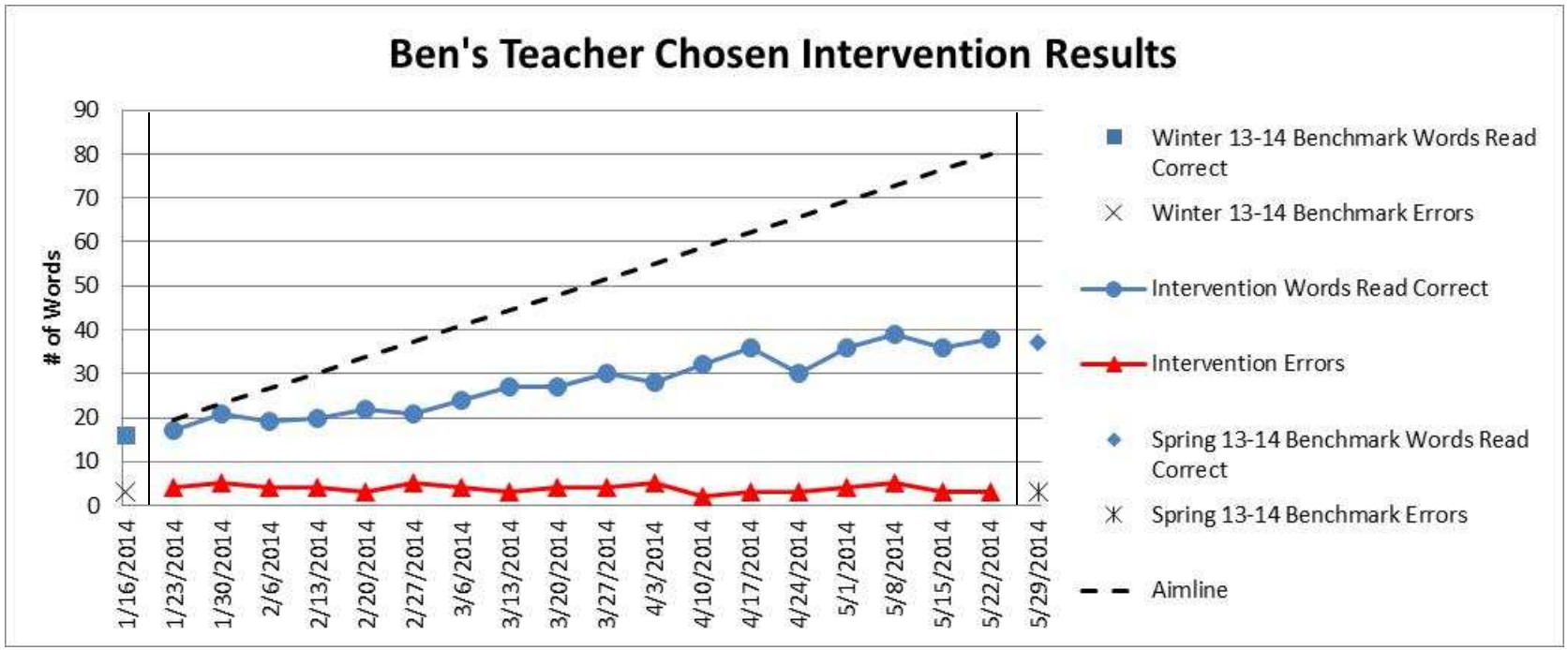

Figure 7. Results of Ben's Teacher Chosen Intervention.

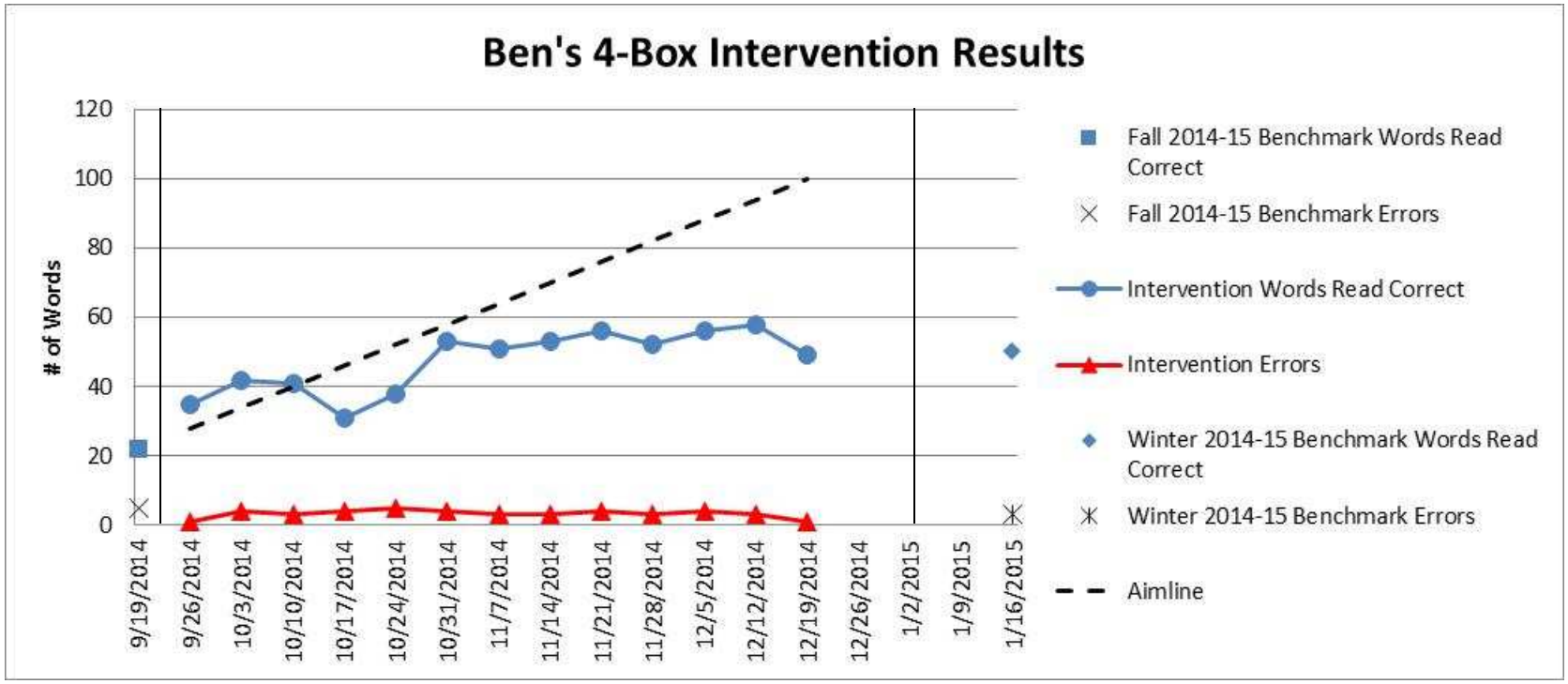

Figure 8. Results of Ben's 4-Box Intervention.

Ben needed to increase the number of words he read correct by 3.56 words per week to meet his end of the year reading goal and the intervention only resulted in an increase of 1.17 words per week. The accuracy of Ben's reading averaged 87% during the course of this intervention below the desired level of 95%. Additionally, the results of the 2013-14 spring oral reading fluency benchmark screening indicated that Ben failed to meet his reading goal. He read 37 words correct per minute with 93% accuracy falling 30 words short of the spring benchmark target of 80 words correct per minute with 95% accuracy.

Figure 8 shows the results of Ben's most recent reading intervention using the 4-Box Decision Making Model to guide the choice of reading intervention. Ben correctly read 22 words correct per minute with 81% accuracy during the 2014-15 fall oral reading fluency benchmark screening. The target number of words read correctly per minute for second grade students at that time of year is 71 with at least 95% accuracy. Ben fell short of meeting both the target for the number of words read correct per minute and the target for reading accuracy, indicating a need for an intervention focused on teaching decoding skills according to the 4-Box Decision Making Model. Upon further assessment of Ben's decoding skills it was determined that he was fluent in his ability to identify letter sounds but struggled in his ability to blend letter sounds together to make words therefore indicating a need for a word blending intervention. As a result, Ben was provided a with a word blending intervention in combination with repeated reading of text at his reading level to allow for the generalization of his word blending skills to connected text. Ben received this intervention for 20 minutes a day, 5 days a week.

The results of this intervention indicate that Ben made slow progress in the number of words read correct per minute, as the majority of his progress monitoring data points fell below the aim-line indicative of meeting his reading goal of 100 words read correct per minute. Ben

needed to increase the number of words he read correct by 6 words per week and the intervention only resulted in an increase of 2.15 words per week. However, Ben's reading accuracy improved from his 81% accuracy rate during the fall benchmark screening to an average of 93% during the course of this intervention. Additionally, the results of the 2014-15 winter oral reading fluency benchmark screening indicate that Ben correctly read 50 words per minute with 94% accuracy, a definite improvement over his fall oral reading fluency benchmark screening scores.

A direct comparison of Ben's intervention indicated by the 4-Box Model with the previous teacher chosen intervention reveals greater reading success for Ben with the 4-Box Model intervention. Ben achieved a rate of increase of 2.15 words correct per minute each week with an average accuracy rate of 93% during the intervention indicated by the 4-Box Model. When he received the teacher chosen intervention he achieved a rate of increase of 1.17 words correct per minute each week with an average accuracy rate of 87%. Therefore, Ben gained 0.98 more words per week with a 6% increase in his reading accuracy when provided the intervention indicated by the 4-Box Model rather than the teacher chosen intervention. Additionally, the improvement rate difference, calculated based on the difference between the number of words read correct between the 4-Box Model intervention and teacher chosen intervention was 0.77 indicating a significant improvement in Ben's reading when provided the intervention indicated by the 4-Box Model.

Holly's Intervention Results. The results of Holly's reading interventions are displayed in Figure 9 and Figure 10. Figure 9 shows the results of Holly's previous reading intervention which occurred during the second half of the 2013-14 school year and was chosen by her teachers. Holly was identified as a student in need of a reading intervention following the 2013-14 winter oral reading fluency benchmark screening which indicated that she was reading 17

words correct per minute with 74% accuracy. The target number of words read correct for first graders at that time of year is 51 with 95% accuracy. As a result, Holly received a reading intervention chosen by her teachers which consisted of repeated practice of sight words using flash cards and taking turns reading with her teacher from a book at her reading level for 20 minutes five days per week.

The results of this intervention indicated that Holly slowly increased the number of words she was able to read per minute. However, her reading progress fell below the aim-line indicative of being on track to meet her reading goal at the end of the school year and she continued to make frequent errors in her reading, failing to achieve the desired accuracy rate of 95%. Holly needed to increase the number of words she read correct by 3.5 words per week to meet her end of the year reading goal and the intervention only resulted in an increase of 1.67 words per week. The accuracy of Holly's reading averaged 87% during the course of this intervention below the desired level of 95%. Additionally, the results of the 2013-14 spring oral reading fluency benchmark screening indicated that Holly failed to meet her reading goal. She read 47 words correct per minute with 92% accuracy falling 33 words short of the spring benchmark target of 80 words correct per minute with 95% accuracy.

Figure 10 shows the results of Holly's most recent reading intervention using the 4-Box Decision Making Model to guide the choice of reading intervention. Holly read 24 words correct per minute with 77% accuracy during the 2014-15 fall oral reading fluency benchmark screening. The target number of words read correctly per minute for second grade students at that time of year is 71 with at least 95% accuracy.

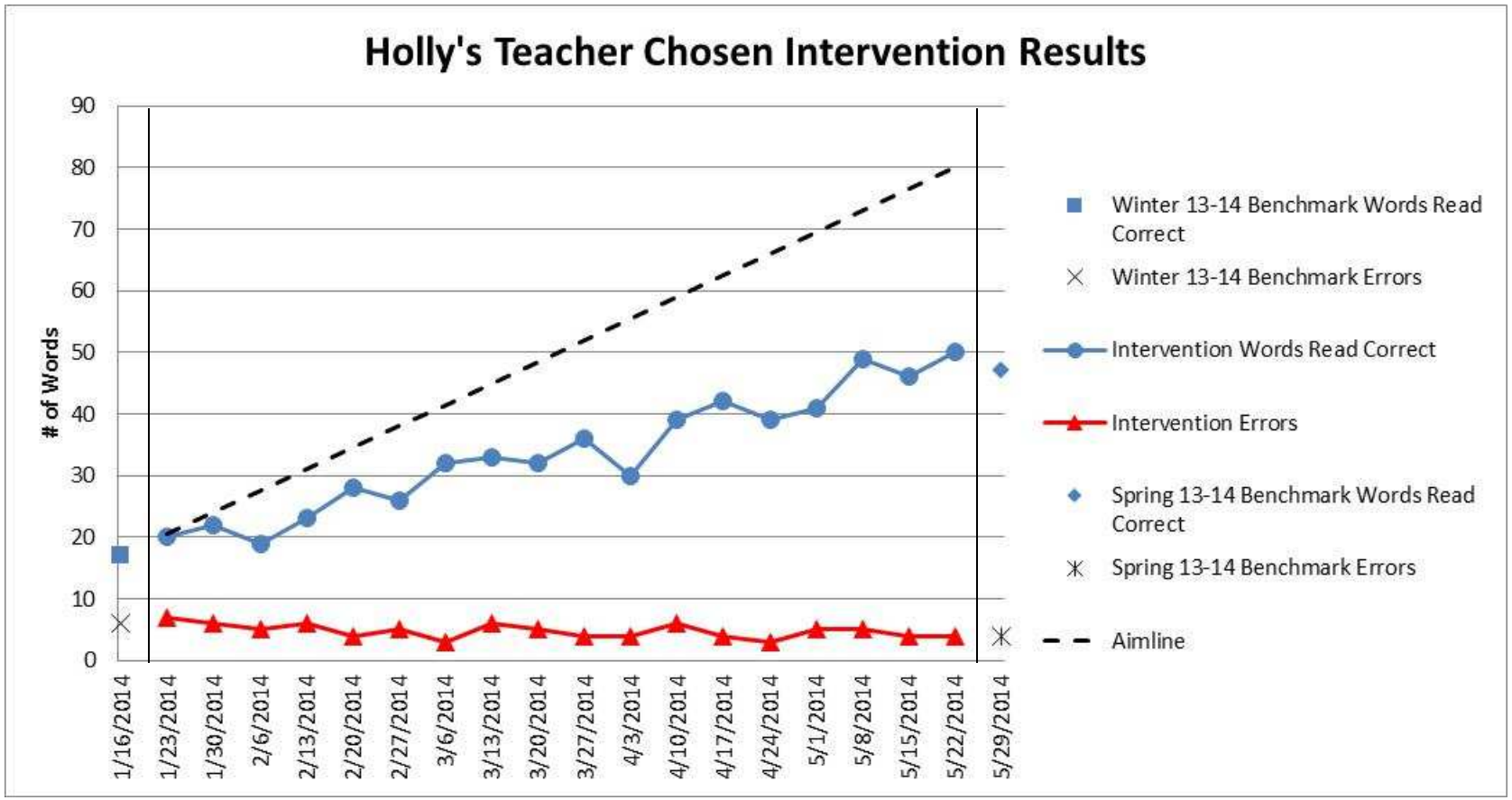

Figure 9. Results of Holly's Teacher Chosen Intervention.

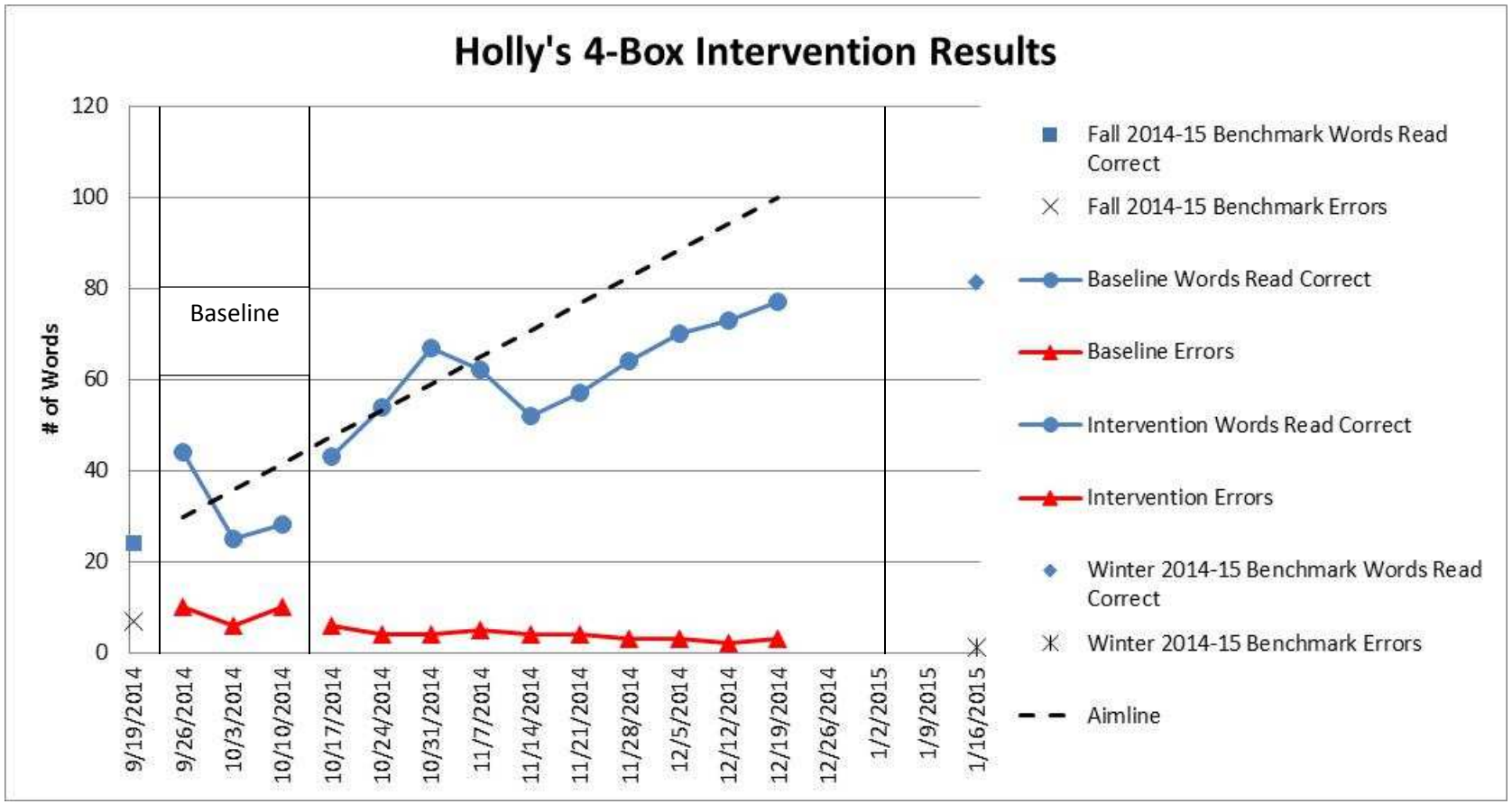

Figure 10. Results of Holly's 4-Box Intervention.

Holly fell short of meeting both the target for the number of words read correct per minute and the target for reading accuracy, indicating a need for an intervention focused on teaching decoding skills according to the 4-Box Decision Making Model. Upon further assessment of Holly's decoding skills it was determined that she was fluent in her ability to identify letter sounds but struggled in her ability to blend letter sounds together to make words therefore indicating a need for a word blending intervention. As a result, Holly was provided with a word blending intervention in combination with repeated reading of text at her reading level to allow for the generalization of her word blending skills to connected text. She received this intervention for 20 minutes a day, 5 days a week.

The results of this intervention indicate that Holly made consistent progress, but failed to maintain the rate of gain indicated by the aim-line that would have allow her to meet her reading goal of 100 words read correct per minute. Holly needed to increase the number of words she read correct by 5.85 words per week and the intervention only resulted in an increase of 4.38 words per week. However, Holly's reading accuracy improved from her 77% accuracy rate during the fall benchmark screening to an average of 94% during the course of this intervention. Additionally, the results of the 2014-15 winter oral reading fluency benchmark screening indicate that Holly correctly read 81 words per minute with 99% accuracy, meeting her reading accuracy goal, but falling 19 words short of the target for the number of words read correct per minute.

A direct comparison of Holly's intervention indicated by the 4-Box Model with the previous teacher chosen intervention reveals greater reading success for her with the 4-Box Model intervention. She achieved a rate of increase of 4.38 words correct per minute each week with an average accuracy rate of 94% during the intervention indicated by the 4-Box Model.

When she received the teacher chosen intervention she achieved a rate of increase of 1.67 words correct per minute each week with an average accuracy rate of 87%. Therefore, Holly gained 2.71 more words per week with a 7% increase in her reading accuracy when provided the intervention indicated by the 4-Box Model rather than the teacher chosen intervention. Additionally, the improvement rate difference, calculated based on the difference between the number of words read correct between the 4-Box Model intervention and teacher chosen intervention was 0.90 indicating a significant improvement in Holly's reading when provided the intervention indicated by the 4-Box Model.

Quadrant #4 of the 4-Box Decision Making Model

There was only one student, Darrin, that fell into quadrant #4 of the 4-Box Decision Making Model based on the results of the 2014-15 fall oral reading fluency benchmark screening. He received an intervention focused on improving his ability to slow down his reading and correct his reading errors (Appendix H). The results of this intervention indicated by the 4-Box Decision Making Model are displayed, as well as the results of his previous reading intervention which was chosen by his teachers.

Darrin's Intervention Results. The results of Darrin's reading interventions are displayed in Figure 11 and Figure 12. Figure 11 shows the results of Darrin's previous reading intervention which occurred during the second half of the 2013-14 school year and was chosen by his teachers. Darrin was identified as a student in need of a reading intervention following the 2013-14 winter oral reading fluency benchmark screening which indicated that he was reading 44 words correct per minute with 92% accuracy. The target number of words read correct for first graders at that time of year was 51 with 95% accuracy. As a result, Darrin received a reading intervention chosen by his teachers which consisted of repeated practice of sight words

using flash cards and taking turns reading with his teacher from a book at his reading level for 20 minutes five days a week.

The results of this intervention indicate that Darrin steadily increased the number of words he was able to read per minute, as well as increased his reading accuracy. However, his reading progress consistently fell below the aim-line indicative of being on track to meet his reading goal at the end of the school year. Darrin needed to increase the number of words he read correct by 2.00 words per week to meet his end of the year reading goal and the intervention only resulted in an increase of 1.5 words per week. During the 2013-14 spring oral reading fluency benchmark screening Darrin failed to meet his reading goal. He read 71 words correct per minute with 99% accuracy, meeting his accuracy goal, but falling 9 words short of the spring benchmark target of 80 words correct per minute.

Figure 12 shows the results of Darrin's most recent reading intervention using the 4-Box Decision Making Model to guide the choice of reading intervention. He correctly read 75 words correct per minute with 94% accuracy during the 2014-15 fall oral reading fluency benchmark screening. The target number of words read correctly per minute for second grade students at that time of year is 71 with at least 95% accuracy. Therefore, Darrin met the reading fluency goal, but fell short of the desired 95% accuracy level. As a result, Darrin was provided with a reading intervention called table tap that focused on slowing down his reading and increasing his reading accuracy for 20 minutes five days a week.

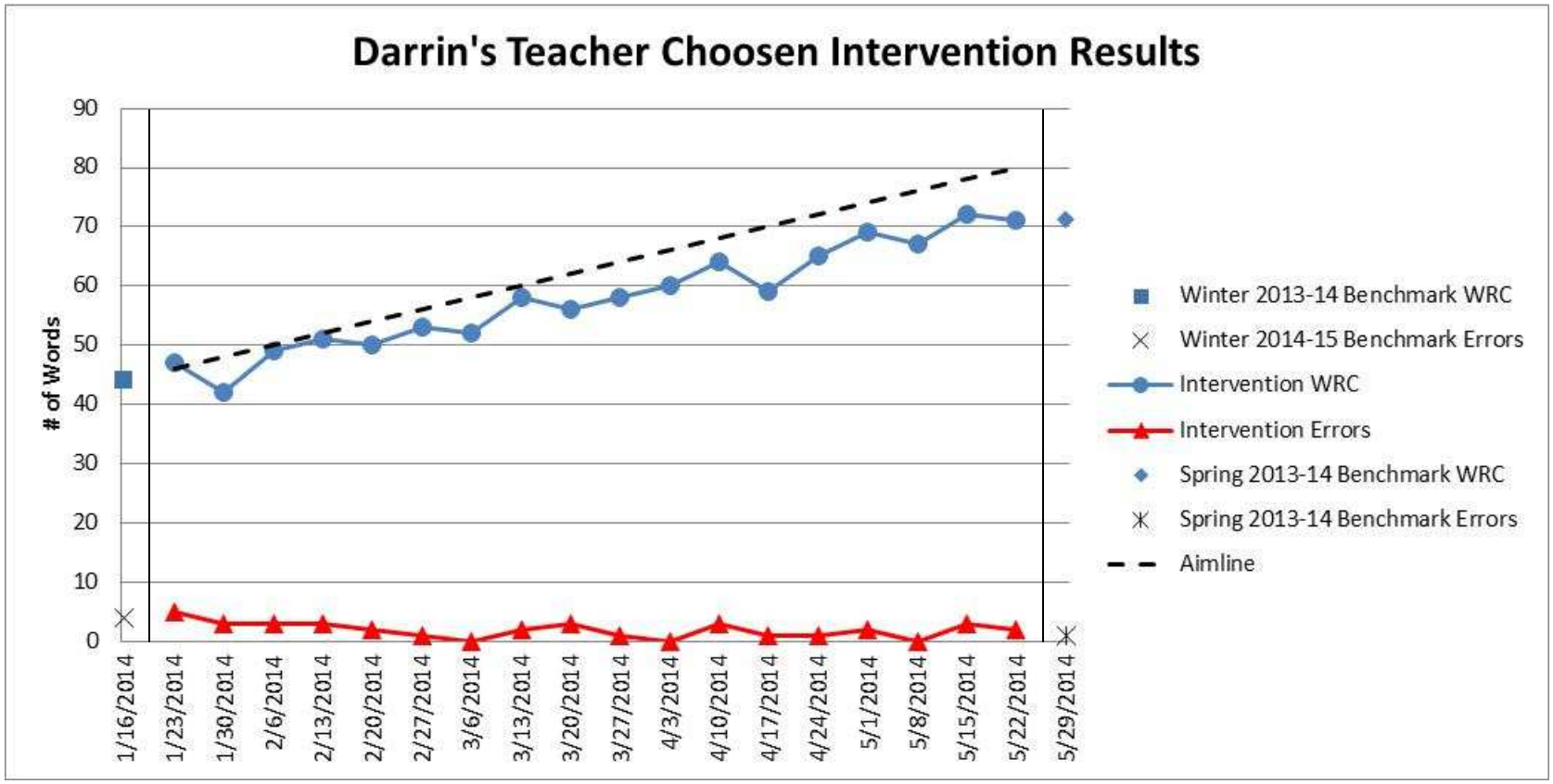

Figure 11. Results of Darrin's teacher chosen intervention.

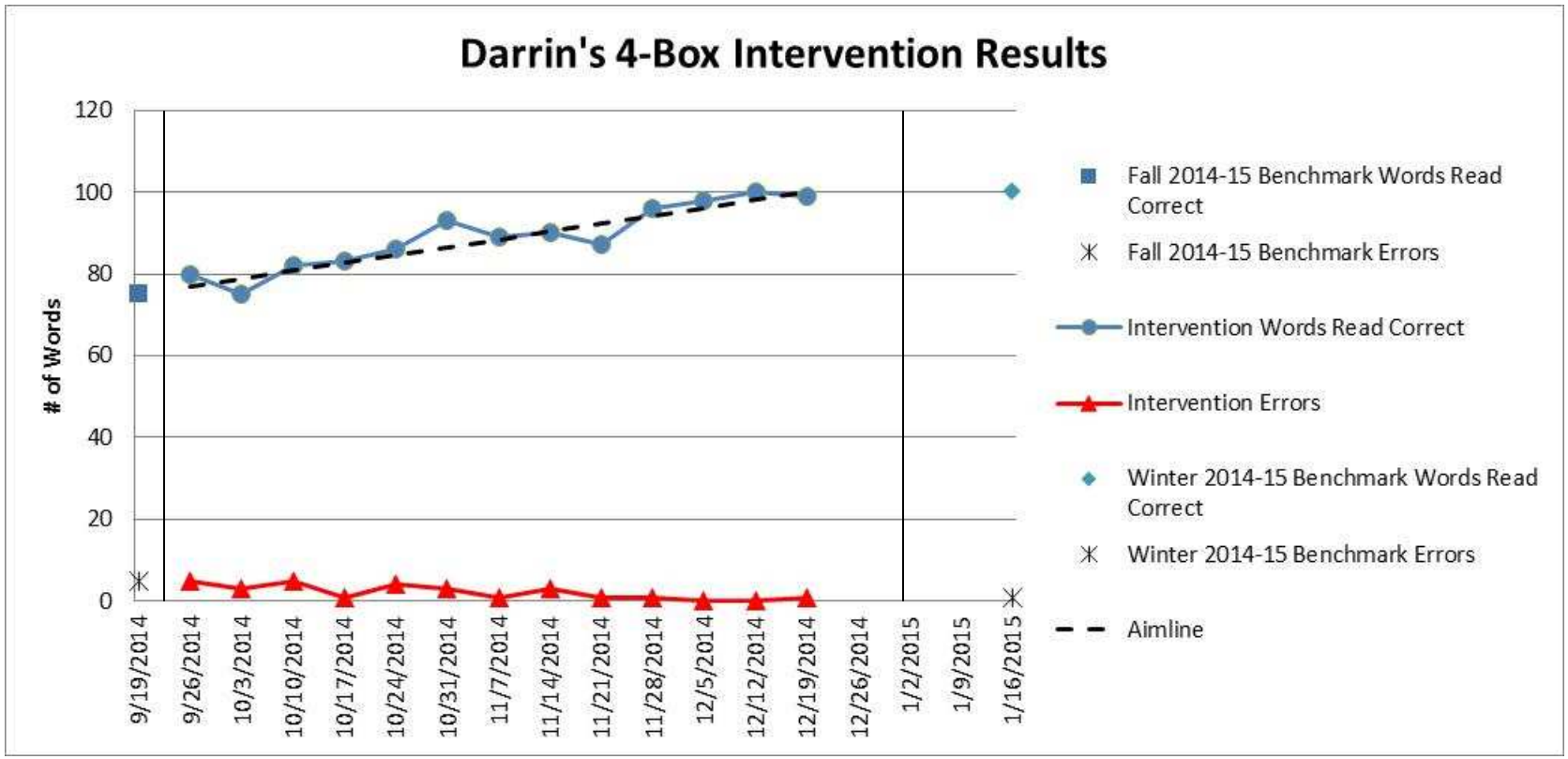

Figure 12. Results of Darrin's 4-Box intervention results.

The results of this intervention indicate that Darrin made consistent reading progress that exceeded or closely followed the aim-line indicative of meeting his reading goal of 100 words read correct per minute with at least 95% accuracy by the 2014-15 winter oral reading fluency benchmark screening. Darrin needed to increase his number of words read correct per minute by 1.92 words per week to meet this goal which he did. Additionally, Darrin improved his reading accuracy rate averaging 98% accuracy throughout the intervention period. The results of the 2014-15 winter oral reading fluency benchmark screening also indicated an improvement in Darrin's reading. Darrin correctly read 100 words per minute with 99% accuracy, meeting his reading goal and indicating that Darrin no longer was in need of a reading intervention.

A direct comparison of Darrin's intervention indicated by the 4-Box Model with the previous teacher chosen intervention reveals greater reading success for him with the 4-Box Model intervention. He achieved a rate of increase of 1.92 words correct per minute each week with an average accuracy rate of 98% during the intervention indicated by the 4-Box Model. When he received the teacher chosen intervention he achieved a rate of increase of 1.5 words correct per minute each week with an average accuracy rate of 97%. Therefore, Darrin gained 0.42 more words per week with a 1% increase in his reading accuracy when provided the intervention indicated by the 4-Box Model rather than the teacher chosen intervention. Additionally, the improvement rate difference, calculated based on the difference between the number of words read correct between the 4-Box Model intervention and teacher chosen intervention was 1.0 indicating a significant improvement in Darrin's reading when provided the intervention indicated by the 4-Box Model.

CHAPTER V: Discussion

As pointed out by Riley-Tillman, Burns, and Gibbons (2013), interventions are only useful for a particular range of problems and failing to match an evidence-based intervention correctly with a problem it is designed to address is not likely to lead to improvement. Unfortunately, this failure to match evidence-based reading interventions to students with reading skills deficits occurs far too often. Instead, alternative methods of reading intervention selection are used such as choosing the intervention that is most familiar to the interventionist or choosing the intervention that requires the least amount of time and effort (Burns, Riley-Tillman, & VanDerHeyden, 2012). As a result, the use of interventions chosen through alternative methods is called into question.

The purpose of this study was to determine if the use of the 4-Box Instructional Decision Making Model for analyzing reading assessment data and for guiding reading intervention selection resulted in better outcomes for struggling readers when compared to alternative methods. The results of this study indicate that the 4-Box Instructional Decision Making Model was superior to alternative methods used at the elementary school included in this study. Information to support this conclusion was found throughout the study.

First of all, the 4-Box Instructional Decision Making Model resulted in the identification of students in need of a reading intervention that had not been previously identified. These students, Mary and John, had a history of meeting the school district's oral reading fluency benchmark screening targets for the number of words read correct per minute and reading accuracy. However, when their performance on additional measures of reading was examined, as indicated within the 4-Box Model, a deficit in the area of reading comprehension was

identified. As a result, these students got reading support that they otherwise would not have received.

Secondly, the use of 4-Box Instructional Decision Making Model lead to the selection of reading interventions that improved student reading performance. All students who received reading interventions specified by the 4-Box Model made progress towards or met their reading goal.

In quadrant #1, Mary and John both increased their scores on the Northwest Evaluation Association Measures of Academic Progress (MAP) by 10 and 11 points. As a result, with half a school year left, they are both only one point on the MAP test away from increasing their chance of proficiency on the Minnesota Comprehensive Assessment of Reading from less than 25% to between 25% - 75%.

In quadrant #2, Emmitt and Vince both increased their reading fluency. In fact, they both increased enough that they met the 2014-15 winter oral reading fluency benchmark screening targets and no longer are in need of a reading intervention.

In quadrant #3, Ben and Holly gradually increased their reading fluency, but most importantly they both increased their reading accuracy. Ben increased his reading accuracy from 81% in the 2014-15 fall oral reading fluency benchmark screening to 94% during the 2014-15 winter oral reading fluency benchmark screening. While Holly, increased her reading accuracy from 77% in the 2014-15 fall oral reading fluency benchmark screening to 99% during the 2014-15 winter oral reading fluency benchmark screening. As a result, Holly is no longer in need of a reading intervention focused on decoding, but is now ready to focus on improving her oral reading fluency.

In quadrant #4, Darrin also increased his reading accuracy, as well as his reading fluency. During the 2014-15 winter oral reading fluency benchmark screening he met both the fluency and accuracy targets and no longer is in need of a reading intervention.

Finally, when possible, the results of the interventions indicated by the 4-Box Instructional Decision Making Model were compared to previously implemented teacher chosen interventions. This comparison was possible for five of the seven participants, with the results of the 4-Box Instructional Decision Making Model producing better results in all five cases. The intervention indicated by the 4-Box Model resulted in a higher rate of increase per week in the number of words read correctly, as well as a higher average percentage of reading accuracy for all participants. Additionally, the improvement rate difference, calculated based on the difference between the number of words read correct between the 4-Box Model intervention and teacher chosen intervention indicated a significant improvement in all participants reading with scores ranging from 0.77 to 1.00.

Limitations

Despite the strengths of this study, several limitations must be acknowledged. First of all, the small number of participants and lack of participant diversity limit the ability to make broad generalizations regarding the effectiveness of the 4-Box Instructional Decision Making Model. Secondly, although the reading interventionists remained the same throughout the study, the general education classroom teachers for all of the participants changed during the research study and may have had an effect on their reading achievement. Finally, the summer break that occurred between the teacher chosen reading intervention and the intervention indicated by the 4-Box Instructional Decision Making Model may have influenced a student's reading success

rate if the student received reading instruction over the summer that was not accounted for in this study.

Implications/Future Research

The results of this study suggest that the 4-Box Instructional Decision Making Model is a useful tool for helping to identify students in need of reading interventions, as well as guide the selection of those reading interventions based on student reading deficits. However, due to the small number of participants, lack of participant diversity, and the use of only one elementary school within the present study, a study exploring the effectiveness of the 4-Box Instructional Decision Making Model on a much large scale would seem appropriate. The focus of the study could be on determining the effectiveness of the 4-Box Instructional Decision Making Model across various schools, grade levels, and students of diversity.

Another study could also examine whether or not the 4-Box Instructional Decision Making Model results in an increase in reading proficiency as measured by state or national reading examinations. Although the current study demonstrated an improvement in reading performance for all participants, with their reading performance being used to predict likely success on the state of Minnesota's comprehensive assessment of reading, their actual performance on the state test of reading proficiency was not measured.

Finally, a study comparing the 4-Box Instructional Decision Making Model to other methods of matching evidence-based reading interventions to struggling students would be useful. For example, the use of Brief Experimental Analysis (BEA) has been demonstrated to be effective and efficient in identifying appropriate interventions for struggling readers (Burns & Wagner, 2008; Daly et al., 1998, 1999; Eckert et al., 2000, 2002; Jones & Wickstrom, 2002). However, the process of matching struggling readers to evidence-based interventions varies

considerably between 4-Box Model and BEA. The 4-Box Model relies on the use of benchmark screening data to match multiple students to evidence-based interventions. However, the BEA provides an empirical evaluation of each individual student's response to different interventions to identify the most effective and efficient course of action. Therefore, a direct comparison of these methods would appear warranted as each method appears to have pros and cons.

Conclusion

The 4-Box Instructional Decision Making Model developed by Harkin in 2008 is a concise and easily interpreted tool for making instructional decisions for struggling readers. It emphasizes the five key elements of reading instruction and follows widely accepted theory of reading development. Its use in this study demonstrated its effectiveness in identifying students in need of reading interventions as well as guiding the selection of more effective reading interventions for them. The 4-Box Instructional Decision Making Model not only resulted in effective reading interventions being selected for all participants, but it also produced better reading outcomes when compared to other methods of intervention selection (e.g., doing what you have always done or using what is available and easiest to implement).

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Chapter VII: Appendices

Appendix A: Agency Consent

Dear Dr. Houlihan,

I am familiar with your research project titled "Linking Reading Assessment Data to Reading Interventions using the 4-Box Decision Making Model" and your desire to have (name of school) involved with it. I understand the role of (name of school) to be allowing access to students' archival reading data and allowing the school's reading interventionists to consult with and be guided by Jeremy Husfeldt, the student researcher, when working with students in need of reading interventions. I also understand that Jeremy Husfeldt will observe the reading interventionists and students during reading interventions and data collection procedures.

We have also discussed the role of (name of school) employees and students and I am satisfied that their safety and welfare are adequately protected as described in the research protocol. In addition, I understand that this research will be carried out following sound ethical principles and that involvement in this research, for both (name of school) and its employees and students, is strictly voluntary and guarantees the protection of participants' privacy. I agree that there will be no negative consequences for potential participants, whether reading interventionists or students, based on whether or not they choose to participate in the study.

Therefore, as principal of (name of school), I agree to allow you to conduct your research at our school.

Sincerely, Date: _____

Appendix B: Teacher/Reading Interventionist Consent

(Teacher's Name),

My name is Jeremy Husfeldt. I am a graduate student in the School Psychology Doctoral Program at Minnesota State University, Mankato. I would like to conduct research in your school under the supervision of my advisor from the Department of School Psychology, Dr. Dan Houlihan, a licensed school psychologist. The purpose of this study is to use a model for instructional decision making to link student reading assessment data to research-based reading interventions.

If you agree to participate, I would like to teach you how to use the 4-box decision making model to link student reading assessment data to research-based reading interventions based on student needs. I would also like to provide you training on progress monitoring techniques for reading fluency and reading comprehension and how to implement a variety of research-based reading interventions. You will still continue to work with students who are struggling with reading, like you currently do, but you will consult with our research team on how to best proceed with student interventions. Additionally, you will also be observed on occasion by members of the research team.

Your participation in this study is completely voluntary. If at any time you feel like you would not like to be part of this study you are free to stop your involvement by telling the researcher or a member of your school administration. Discontinuing the study will not affect your relationship with your school district or Minnesota State University, Mankato.

A possible risk of participating in this study is that you may feel uncomfortable, as you may be asked to change how you are currently working with some of your students and will have someone observe you when working with your students from time to time.

Possible benefits of participating in this study include learning new methods of collecting, analyzing, and interpreting student reading data and learning how to link that student reading data to specific reading interventions in order to help students read. There is also the potential benefit that your participation will help us link reading assessment data to the best reading instruction for individuals students based on needs, which may help future children learn to read.

All information collected for this study will be kept confidential and will not include personably identifiable information. Your name will not be recorded on any of the materials in this study. Instead, your identity will be recorded as the "Teacher of participant ___" or a pseudonym will be used instead of your real name. Student participant's names will not be used on forms either. All consent forms will be kept in a locked filing cabinet in a secured office at the School Psychology Department of Minnesota State University, Mankato.

If you have any questions please feel free to contact me at jeremy.husfeldt@mnsu.edu or 651-341-2815. You may also contact my advisor, Dr. Dan Houlihan, at dan.houlihan@mnsu.edu or 507-389-6308.

Initial: _____

If you are willing to participate in our study please initial the first page and sign this page of this letter and return it to me. Your signature indicates that you have read and understand the information above and willingly agree to participate.

Your Name (printed): _____

Your Signature: _____ Date: _____

MSU IRBNet Log #:
Date of MSU IRB Approval:

Appendix C: Parent Consent Form

Linking Reading Assessment Data to Intervention using the 4-Box Decision Making Model

(Name of Parent or Guardian),

(Name of Child) is being invited to be in a research study exploring how to use reading assessment data to determine the type of reading instruction that will work best for individual students. Your child was selected as a possible participant because he/she was identified by his/her teacher as a student in need of additional reading instruction. We ask that you read this form and ask any questions that you may have before agreeing to allow your child to be in the study.

This study is being conducted by Jeremy Husfeldt, a graduate student in the School Psychology Program at Minnesota State University, Mankato, under the guidance of Dan Houlihan, Ph.D, licensed school psychologist, and professor at the school psychology program at Minnesota State University, Mankato.

Background Information

The purpose of this study is to identify the reading characteristics of students based on their reading assessment data and link these characteristics to the most beneficial type of reading instruction. Students at different stages of the learning process need different types of instruction to improve their reading ability. Initially, students need to learn to read words correctly. Next, students need to learn to read words quickly and accurately. Finally, students need to learn to comprehend what they are reading. By identifying what stage of the learning process a student is at and linking that stage to appropriate interventions, a teacher is then better able to meet the learning needs of the student.

Procedures

If you decide to allow your child to be in this study, he or she will be asked to leave their general education classroom during the school day and receive additional reading instruction from one of the reading interventionists currently employed at your child's school. If your child is already receiving additional reading instruction from your school's reading interventionists their participation in this study would occur during this reading intervention time. This study will last for eight weeks and will require your child to meet with your school's reading interventionist five times per week for roughly 20-40 minute sessions depending on your child's reading needs. At the end of this study your child will have the option of continuing to meet with and receive reading instruction from the school's reading interventionists for the remainder of the school year unless he or she has made significant progress in reading and the intervention is no longer needed.

Initials: _____

Risks & Benefits of being in the Study

This study has a couple potential risks. First, your child will be asked to read aloud while their reading performance is monitored, which may be uncomfortable for some children. In order to minimize this risk, participants will be reminded that their participation is optional. Also, there is the possibility that some instructional time may be missed in the classroom. However, attempts will be made to conduct the study during non-instructional times as much as possible.

The benefits of participation in this study include having your child receive additional reading instruction and having the information from this study regarding the type of reading instruction that may lead to the best outcomes for your child provided to your child's teacher. Also, your child's participation will help us link reading assessment data to the best reading instruction for individual students, which may help future children learn to read.

Confidentiality

All information obtained from this research study will be kept private. Your child's name will not be released or used on any of the forms for this study with the exception of this consent form. Student participants will be assigned an identification code in order to track and organize their results. All information collected during this study will be stored in a locked file cabinet at Minnesota State University, Mankato.

Right to Refuse Participation

Participation in this study is voluntary. Your decision whether or not to let your child participate will not affect you or your child's future relations with their school or Minnesota State University, Mankato. If you decide to let your child participate, he or she is free to withdraw at any time without explanation or penalty.

Contacts and Questions

This research is being conducted by Jeremy Husfeldt, a school psychology graduate student under the guidance of Dr. Dan Houlihan. If you have any questions, please contact Jeremy at 651-341-2815 or jeremy.husfeldt@mnsu.edu or Dr. Houlihan at 507-389-6308 or daniel.houliah@mnsu.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researchers, you are encouraged to contact the MSU Institutional Review Board Administrator, Dr. Barry Ries, at 507-389-2321 or barry.ries@mnsu.edu.

Initials: _____

Statement of Consent

By signing below you are indicating that you have read the above information and consent for your child to participate in this study.

Name of Parent or Guardian (printed) _____
Signature of Parent or Guardian: _____ Date: _____

MSU IRBnet ID #:
Date of MSU IRB Approval:

Appendix D: Assent for Research Participation

Student's Name: _____

My name is Jeremy Husfeldt and I am a student at Minnesota State University, Mankato. I would like to ask you to be part of a research project that will help adults understand how to better teach elementary school children how to read. You will be asked to work with a reading teacher on different reading activities for 20 to 40 minutes a day for 2 months. Some of these activities could include reading out loud to the reading teacher or answering questions from the reading teacher about what you have read. Your parents and teacher have said that it is okay for you to be out of your classroom for this time.

If you decide that you do not want to be part of this study you can tell me right now and you can go back to your classroom. If you decide to be part of this study now and later change your mind, you can tell your teacher or your parents and you will not have to be part of this study anymore.

_____ _____

Signature Date

MSU IRBNet ID#:

Date of MSU IRB Approval:

Effective Comprehension Strategy Instruction

Example: Finding Main Idea Strategy

Guiding Question	Example Language
1. Does the lesson explicitly explain **what** the strategy is?	Today we are working on a strategy to help find the main idea of a passage of text we read. The main idea is what the story is mostly about
2. Does the lesion explicitly state **when** the strategy is used?	You find the main idea after reading a part of the story
3. Does the lesson explicitly explain **why** the strategy is important to use?	Finding the main idea will help you understand the story and remember important parts of the story
4. Does the lesson explicitly state the **steps** for implementing the strategy?	To find the main idea, you will: 1. Name the who or what the paragraph/section is mostly about 2. Tell the most important information about the who or what 3. State the main idea in 10 words or less

Cooperative Parenting

Most animals leave the frozen Antarctic ice during the winter, but the emperor penguin stays and even incubates its eggs during the coldest months. Father penguins nestle the eggs in special areas on thief feet, while the females go to sea to hunt and feed. During the intense cold, the males remain on the ice in an enormous group. They trade places from the outside to the inside in order to share the warmth

5. Does the lesson plan suggest **think-alouds** the teacher can use to repeatedly state and model the "secret" of implementing the strategy successfully, so students will be able to "see" the mental workings or the thinking processes involved?	This part of the story is mostly about emperor penguins because most of the sentences give you information about them: Where they live in the winter, how they keep warm, and how they incubate eggs. The most important information about the emperor penguin is: they incubate eggs, and they stay in a large group and trade places to keep warm while they incubate the eggs. (Could also explain each phrase – why each is important or not) So, I would say the main idea is either (always give >1): ▪ Emperor penguins huddle together to stay warm while incubating eggs ▪ Emperor penguins keep warm in a large group while incubating eggs Don't let students just take 1 important info statement as the main idea – must synthesize
6. Does the lesson provide **scaffolded practice**, with students having multiple opportunities to practice with teacher guidance, gradually moving to independent strategy use?	Scaffolded instruction consists of the modeling, teacher assisted, and independent phases. After modeling the strategy using think-alouds, provide opportunities for students to practice generating main ideas. Begin each lesson in the teacher assisted phase by asking students questions that will facilitate automaticity in using the strategy What is a main idea? When do you find the main idea? Why do you find the main idea? What are the steps of the main idea? **Modeling Phase:** Model the main idea strategy using think-alouds until students are reading for the teacher assisted phase of instruction (A minimum of 3 models would be provided before moving into the teacher assisted phase) **Teacher Assisted Phase:** During this phase, lead students through each step of the strategy (A minimum of 3 teacher lead practice opportunities should be provided before moving to the independent phase). **Independent Phase:** After each independent practice opportunity, remember to conduct a debrief by asking students to share the main idea statements they generated. Remember to ask students to explain (think aloud) how they came up with their main idea statement. Return to teacher assisted phase if it is evident that students need additional instruction.

7. Does the lesson focus on **two purposes**: reading for text content and for application of the strategy?	
8. Does the lesson close with an **explicit statement** about the strategy and how to implement it?	At the end of the lesson, ask the following questions as a closure activity: 1. What is the main idea? 2. When do you find a main idea? 3. Why do we find a main idea? 4. What are the steps of the main idea strategy?

Appendix F: Repeated Reading with Comprehension Strategy Intervention

Repeated Reading with Comprehension Strategy Practice

Objective: To increase fluent reading on passages for students who
- read with high accuracy
- show benefit from repeated practice on the same passage

Materials: 2 copies each of texts that the student can read with at least 95% accuracy
Stop-watch
Pencil/pen for teacher to mark errors
Scrap paper for teacher to make notes as needed about student responses to questions

Sequence:
1. Prior to working with a student, teacher previews the passage to be sure he/she is comfortable responding to the questions that will be asked during the intervention sequence.
2. Teacher explains that students will be reading a passage multiple times to work on increasing fluency, that fluency is rate and accuracy and expression – not just speed, and that the student will be answering questions about the passage.
3. Teacher gives copies of passages to student
4. Teacher explains that for the first reading out-loud, the student will read for 1 minute.
5. Teacher says "Begin" (not "Start") and starts stop-watch.
6. Student reads passage out-loud.
7. Teacher marks errors on own sheet and monitors stopwatch. At one minute, teacher says "Stop" and marks the last word read by the student.
8. Teacher records number of correct words per minute and graphs results, showing the graph to the student or has the student quickly graph the score.
9. Teacher provides explicit feedback to the student regarding student rate and number of errors and quality of reading expression.
10. Teacher provides standard error correction for each word the student read in error. ("That word is _____. What word?" The student repeats the word. Teacher says, "Yes. That word is _____." Student goes back to the beginning of the sentence to begin again.)
11. Teacher explains that the student will read the same passage a second time, and that after reading, the student will be asked to say "who or what the passage is mostly about." (Note to teacher: the answer to this question should be the main character if it is a narrative passage or the main subject if it is an expository passage).
12. Repeat steps 5-7
13. Teacher asks student "Tell me who or what this passage is mostly about." Teacher provides praise if the student's response is reasonable, or briefly models an appropriate response if the student's response is not reasonable. ("I think this passage is mostly about…").
14. Repeat steps 8-10
15. Teacher explains that the student will read the same passage a third time, and that after reading, the student will be asked to say the "most important thing he/she learned about (the who or what)." (Note to teacher: the answer to this question should be the main idea/theme based on what they have read so far).
16. Repeat steps 5-7
17. Teacher asks student "Tell me the most important thing you learned about (restate the who or what)." Teacher provides praise if the student's response is reasonable, or briefly models an appropriate response if the student's response is not reasonable. ("I learned that…").
18. Repeat steps 8-10
19. Teacher explains that the student will read the same passage a final time, and that after reading, the student will be asked to "predict what the rest of the passage will be about."

20. Repeat steps 5-7
21. Teacher asks student "Based on what you have read so far, what do you predict the rest of the passage will be about?" Teacher provides praise if the student's predication is reasonable and not too general, or briefly models an appropriate prediction if the student's response is not reasonable, or is too general. ("I predict that…")
22. Repeat steps 8-10
23. Teacher says, "Now keep your voice with mine as we read the rest of the passage together so we can find out if your prediction was accurate." Student matches teacher pace, reading aloud while teacher reads with good expression at a pace that the student can follow.
24. Teacher says "You predicted that the rest of this passage would be about _____. Was your prediction accurate? Teacher provides praise if student correctly identifies that his/her prediction was accurate, or correctly identifies that his/her prediction was not accurate. Teacher briefly models the correct response if student does not provide it.
25. If the student did not provide a reasonable answer to any of the comprehension question, teacher models a final statement including a concise statement of who or what the passage was mostly about, the most important thing about the who or what, the prediction given, whether the prediction was accurate, and if the prediction was not accurate, what the rest of the passage was actually about. ("This passage was about ____, and we learned that ____. You predicted that in the rest of the passage we would learn about _____, and you were correct (or) but actually….").
    If student responses were all reasonable, skip this step.
26. Teacher asks "What does this passage make you think about? Almost any response is acceptable, but teacher does model if the student does not give any response. (Note to teacher: The purpose of this question is to encourage the student to make a text to text, text to self, or text to world connection).

Appendix G: Word Blending Intervention

Blending Words

Objective: To increase skill in blending letter sounds to make simple words for students who
- Have mastered letter sound correspondence with the letters in the words you will be blending
- Have not yet mastered this skill

Materials: List of words printed in a size students can read

Sequence:
1. **Explain:** Teacher says to the student "Today you're going to practice blending sounds to make words to become an even better reader. When I touch under a letter you'll say the sound for that letter. When you blend, don't stop between sounds. When I slide my finger under the whole word, you'll say the word." This explanation may be shortened for students who have had experience with this intervention, but some explanation & rationale must be given at the start of every session.
2. **Model:** Teacher says to the student "I'll model for you how blend two words. My turn." Teacher models for the students, using the signaling procedure described above with only the teacher responding. An adult model is to be provided at the start of every session, even if the student is familiar with the expectations of the task.
3. **Practice:** Teacher says to the student "Your turn." Teacher practices with student. Teacher maintains brisk pace, with little pause between words.
4. **Correction:** Any time a student responds incorrectly, the teacher immediately says "My turn," demonstrates the correct response, then says "Your turn" has the student respond to the same word, backs up 2 words and continues forward so that the word identified incorrectly comes back up again. (i.e., "My turn. /m/ /o/ /m/ mom. Your turn." (signal for student response)).

What If I Don't See Progress?

1. Reduce the number of words on the list you are practicing and repeat the list more times
2. Work on only two phoneme words or words with only continuous letter sounds until immediate mastery is noted on these
3. Provide a model for more words
4. Be certain that error correction procedures being delivered correctly

Appendix H: Pencil Tap Intervention

Pencil Tap

Objective: To increase reading fluency for students who:
- make many reading errors which they do not independently self correct
- demonstrate the skills to correct words read in error when cued to do so

Materials: Short texts in which the student is able to self correct most errors if given a cue from the teacher to do so
- Either a highlighter you can wipe off a page protector over the passage between each reading, or 3 copies of the passage
- Pencil with eraser for tapping

Sequence:
1. **Explain**: Teacher says, "Today you are going to do some reading out loud for me. Each sentence you read without any errors, I am going to highlight. If you do make a mistake, I am going to tap my pencil. If I tap my pencil, you stop, fix your error, then go back to the beginning of the sentence to read again. Remember, stop, fix, go back. What will you do if I tap my pencil?" Student demonstrates understanding of this procedure each session.
2. **First Reading**: Student begins reading from text. Teacher quickly highlights each sentence the student reads without error as soon as the student has finished that sentence. Teacher taps pencil lightly but immediately each time the student makes a reading error. Suggestion: tap lightly with the eraser of a pencil.
3. After tapping, the teacher waits silently for 5 seconds. If the student makes the correction, praise him/her for correcting his/her own mistake. He/She goes back to the beginning of the sentence and starts reading again.
4. If the student does not self-correct the word he/she missed, use the standard correction, "That word is _____. What word?" The student repeats the word. Teacher says, "Yes. That word is _____." Student goes back to the beginning of the sentence to begin again.
5. **Second and Third Readings:** Follow the same format each time, repeating the same passage for a total of 3 readings.

What If I Don't See Progress?

1. Make sure pencil tap is being delivered immediately after each error
2. Does the student self correct most errors when given a cue but no additional assistance?
3. Has there been sufficient praise?
4. Are the error correction procedures being delivered correctly and consistently?