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It is entitled:
A Collaborative Procedure to Support Teacher Adherence to Reading Comprehension Intervention and Its Effect on Student Outcomes

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A Collaborative Procedure to Support Teacher Adherence to Reading Comprehension Intervention and Its Effect on Student Outcomes

A dissertation submitted to the
Division of Research and Advanced Studies of the
University of Cincinnati

In partial fulfillment of the
Requirements for the degree of
Doctor of Philosophy
In the Department of Communication Sciences and Disorders
in the College of Allied Health Sciences
2011
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ABSTRACT

Response to Intervention (RtI) is a multi-tiered approach to provide evidence-based instruction to all students. Within a RtI paradigm, teachers and other professionals collaborate to design interventions for students who are at-risk for a learning disability. Despite the widespread use of RtI paradigms in educational settings, few studies have documented the efficacy of collaboration and teacher follow-through in intervention planning. This study examined support for children requiring Tier 2 interventions, which address at-risk students and are typically conducted in the regular classroom. Specifically, the purpose of this study was to determine whether reading comprehension interventions could be delivered in a systematic, collaborative procedure involving performance feedback meetings. A SLP collaborated with the teacher in grades 2, 3, 4, and 5 to develop the interventions and trained the teacher to use them. The study measured the percentage of intervention steps adhered to by the teachers, teachers’ attitudes toward the interventions, and the impact on student outcomes.

Using a multiple baseline across subjects design, this study found that the performance feedback meetings supported teacher adherence to the intervention in 50% of the teacher subjects. All teachers’ adherence to the intervention improved from teacher training to performance feedback meeting phases. A t-test for related measures revealed that with 99% confidence, the intervention positively impacted student grades. One implication is that a collaborative framework can support the precise implementation of reading comprehension interventions in the classroom which ultimately can improve student outcomes.
Acknowledgements

It is hard to put down on paper the gratitude that I feel toward the people who have helped me along this journey. Gratitude doesn’t even come close to illustrating the feelings I have toward my dissertation committee, my family and my friends who all have all helped me reach my lifelong goal.

First, I would like to thank my committee chair, Dr. Nancy Creaghead. For the past twenty years, she has been my teacher. Her guidance was never constrained by four classroom walls. Her devotion to our field and child language provided me with a firm foundation to become an effective speech language pathologist in the schools. Her ideas and theories directed me even when she wasn’t near. I was very lucky and honored to have her as my academic adviser, mentor and dissertation chair. Her patience, advice and leadership are important factors in why I am graduating. Many students are afraid of her red editing pen. I welcome it because I learn so much from her views and experiences in research and teaching whenever I read what she recommends.

Dr. Jo-Anne Prendeville has been a constant during the last four years. I enjoy listening and learning from her. The knowledge she has pertaining to language development and literacy is remarkable. I gained greatly from her expertise, probably even when she didn’t know she was teaching. During our year of working on a collaborative project with several agencies, I was amazed at how she successfully worked with several strong personalities. With her by my side, I was proud to be part of the University of Cincinnati and speech language pathology.

Dr. Renee Hawkins has shown me nothing but kindness since the day I stumbled into her class, which I am still not sure I was eligible to take. Her knowledge on school-based interventions has inspired me to get out of my comfort zone and try new things. I appreciate her taking the time to teach me about single-subject research, response to intervention and progress monitoring. I will never forget her willingness to always find time to fit me into her busy schedule. I am constantly whispering words of thanks about how lucky I am to have had Dr. Hawkins cross my path.
Dr. Lesley Raisor-Becker is such a dynamic person. Her constant words of encouragement have echoed in my ears on the late nights when I felt like throwing in the towel. She has great perspectives on child language and literacy that have helped me with writing this dissertation. Oftentimes when I had trouble writing, something she said in class or during a conference assisted me in getting through the block. I have enjoyed the opportunity to present with her at several conferences. Someday, I hope to light up a room like she does. She always makes me look good.

I have to give a big thank you to my phone-a-friend, Karen Bells. She has been my best friend since birth. She has never let me down, and helping me with my dissertation was no exception. She isn’t a researcher, but she was always willing to help me whenever I needed her. She was my sound board when I needed to figure something out. She helped me rewrite all of my passive sentences with perfect punctuation. She listened to my ideas, which allowed me to write. I will never forget the hours of support she freely gave to me over the past two years. She never complained once.

I have to thank my children, Sarah and Connor. They never complained about the time I spent at school or the long hours I had to spend on school work. They gave up a lot over the past four years in order for me to reach my dream. They inspire me every day. Without them, none of this would matter.

Finally, I have to thank my family. My brothers and sisters have been very supportive and understanding. They never made me feel guilty when my writing prohibited me from attending family events. They pitched in and helped me when I needed it. I appreciate them trying to figure out my statistics with me and helping me format my dissertation. They were by my side for the long haul and I truly appreciate them. To my mom, I thank her for teaching me the value of education. Without her setting the bar high for me, I may never have believed in myself enough to go back to school. To my dear dad, I work with children because of him. His unconditional love for all kids inspired me to be who I am today.
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Chapter 1

Introduction

Alarmingly, 30 percent of all readers at the fourth-grade level do not meet national standards for reading (National Assessment of Educational Progress, 2003). The results for children below poverty thresholds are even bleaker. Douglas and Montiel (2008) found that poor children start kindergarten with lower entry level reading skills and take longer to acquire higher-level reading skills as they move through elementary school. Children have difficulty in reading for a variety of reasons. Researchers have identified five pillars to successful reading, one of which is reading comprehension (the other four being phonemic awareness, phonics, reading fluency and vocabulary) (NRP, 2000). However, the education field is still exploring the most effective ways to apply this information to intervention planning. School districts struggle with how to best differentiate children with a true reading disability from children with reading difficulties due to other factors such as cultural differences, socioeconomic background and poor instruction. A string of identification models employed by school districts to help in this differentiating process have failed. Those invested in this process asked for a comprehensive approach that would provide an authentic look at a child’s problems and base interventions on the assessment results. These stakeholders began putting their faith in a promising model called Response to Intervention (RtI) to solve reading and other academic difficulties. RtI encompasses ideas found in the reauthorization of the federal Individuals with Disabilities Education Act (IDEA) and the No Child Left Behind Act. Renamed the Individuals with Disabilities Education Improvement Act (IDEIA: signed into law in December 2004), it allows the use of data obtained from scientifically based interventions to make eligibility decisions under learning disabilities (Jimerson, Burns & VanDerHeyden, 2007). RtI requires the implementation of evidence-based, scientifically proved instruction and progress monitoring before a child is referred for special education services. The RtI model necessitates that quality, evidence-based instruction is provided to all students in the regular education classroom. Although this model generates excitement, research has found there is a lack of national conformity in its adoption (Berkeley, Bender, Peaster & Saunders, 2009).
It is also important to remember there is much we do not know about RtI, particularly how it will stand up to the test of time. Among the recommended facets of RtI, there are many potential pitfalls that can lead to implementation failure. These include intervention implementation, collaboration among educators and progress monitoring (Kratochwill, Clements, & Kakymon, 2007). Most RtI studies have been tightly controlled showcasing the positive outcomes of RtI. These studies have been conducted by researchers who have some level of expertise in RtI. Few RtI studies have investigated authentic implementation of reading comprehension interventions in the classroom by the teacher within an educational system that can be reluctant to change.

In the upper elementary grades, reading comprehension is often the key to academic success (Mason, Meadan, Hedin & Corso, 2006). The ability to comprehend what is read is a foundational skill that ultimately leads to school success across all academic areas. Comprehension of written text involves processing both simple and complex language. The same depth of language processing skills is responsible for oral language and written text (Cain & Oakhill, 2007). When comprehension failures occur, individuals are limited in their ability to communicate effectively and to acquire new information. For students, this leads to academic struggles and possible academic failure.

We know there is a solid research base on effective reading comprehension interventions. The research on reading comprehension intervention for children with a learning disability recommends explicit strategy instruction (National Reading Panel, 2000). While that factor is important, Pressley, Wharton-McDonald, Mistretta-Hampston and Echevarria (1998) found it uncommon in the classroom. Their research in 10 fourth- and fifth-grade classrooms revealed that students were not taught strategies to monitor their comprehension. The students were asked to summarize, predict or self-question but were not explicitly taught how to do these tasks.

In their summary of most effective reading comprehension interventions, Bursuck and Blanks (2010) include (a) activating background knowledge to make meaning of the text (NRP, 2000); (b) asking questions while reading (Bauamann, Seifert-Kessel, & Jones, 1992); (c) drawing conclusions from text (NRP, 2000); (d) making reasonable predictions (Armbruster, Lehr, & Osborn, 2001); (e) summarizing
the meaning of text (NRP, 2000); (f) self-monitoring comprehension (Boulware, Gooden, Carreker, Thornhill, and Joshi, 2007) and (g) using text structures to derive meaning (Dymock, 2007). The existing body of research primarily has looked at children already identified with reading or learning disabilities. But more research needs to be done with children who are at risk for reading comprehension difficulties under the RtI model.

Response to Intervention (RtI) is a service delivery model. It is a term used to describe a method of providing intervention to all children who are at risk for academic failure (Ehren & Nelson, 2005). RtI continues to evolve into a framework to not only provide intervention for students at risk for school failure but also to develop better methods of classifying children with learning disabilities (Gersten & Dimino, 2006). RtI models are built around tiers of instruction. The implementation of evidence-based reading intervention is housed in a multi-tiered framework progressing from evidence- based instruction in the classroom, to more intensive instruction provided to children at risk for a learning disability to the final tier, which provides intervention to approximately 5% of students needing special education services. RtI has followed on the heels of a succession of models. Problems with past models --- such as the resource-room model, pre-referral intervention model, consultation model and the discrepancy model --- were discovered after years of widespread implementation (Gersten & Dimino, 2006). While there is a small body of research that supports RtI (See Review, Fuchs & Fuchs, 2006), educators do not have critical data from its extended insertion into school districts’ special education policies. Implementation in the real world fraught with deterrents could expose glitches in the RtI model that were masked during researchers’ strictly controlled studies. In 2000, Toth, Klahr and Chen summarized it in this way:

…..This division of labor between laboratory-based cognitive research and classroom research is understandable but, in our view, unnecessary and inefficient because much can be lost in the translation from the psychology laboratory to the classroom (Toth, Klahr, & Chen, 2000, p. 424)
Research has emerged that has investigated RtI in relationship to word attack skills and reading fluency (Vaughn, Wanzek, Murray, Scammacca, Linan-Thompson & Woodruff, 2009; McIntosh, Graves & Gersten, 2007). Studies of reading fluency interventions have given short shrift to reading comprehension; the research has not investigated the implementation of reading comprehension interventions adhering to the RtI framework for Tier 2 instruction (Vaughn et al., 2009; McIntosh et al., 2007).

There are two approaches to service delivery within an RtI model: (1) problem solving approaches and (2) standard-protocol approaches (Fuchs, Mock, Morgan, & Young, 2003). In schools, the two approaches are often combined within a multi-tier model of service delivery (VanDerHeyden, Witt, & Naquin, 2003). In the multi-tiered approach to response to intervention components generally include tiered instruction, collaboration, intervention, progress monitoring and systematic problem solving (McCook, 2006). However, beyond Tier 1 instruction, few studies have investigated how RtI fits into the ecology of the everyday classroom, with the regular education teacher being the primary facilitator of the Tier 2 instruction. Few studies have investigated the importance of collaboration among educators; specifically, the teacher must consult with the educator well-versed in the area of concern. For the purpose of this study, the collaboration being explored is between the teacher and the speech-language pathologist (SLP) as it concerns reading comprehension. If a systematic collaboration procedure is put into place, we do not know if it can lead to successful implementation of reading comprehension interventions in the classroom. We do not know if this procedure, under the framework of RtI, can improve child outcomes or provide data to help make classification decisions.

All tiers require that the intervention be implemented with fidelity. Researchers have shown that classroom interventions are easy to develop, but they are more difficult to implement. Noell et. al (2002) found that accurate intervention implementation does not always occur. In fact, fewer than 10% of teachers in their study adequately implemented a behavioral intervention despite receiving explicit verbal and written instructions. In the consultation literature, many studies have investigated what strengthens or supports treatment integrity. Findings show that techniques such as direct training strategies (feedback,
classroom rehearsals) (Sterling-Turner et al, 2002), role playing and video feedback (LaFleur et al., 1998) improved the implementation of the interventions. In fact, fidelity is critical throughout all tiers of the RtI model to ensure that the correct information is obtained about a student’s progress.

Where progress monitoring is concerned, for example, the Individuals with Disabilities Education Act of 1990 urged school special education teams to set long-range goals with short-term objectives and an effective monitoring system to evaluate student progress. One progress monitoring tool, curriculum-based measurement (CBM) is an alternative assessment used by teachers and school psychologists for monitoring student progress (Stecker, Fuchs & Fuchs, 2005). CBM has been researched and proved as a reliable progress monitoring tool. Deno and his University of Minnesota colleagues were among the first to develop a research program primarily focused on whether teachers could use measurement and evaluation procedures that allowed them to routinely make decisions about when to modify a student's instruction. The research was conducted over 6 years from 1977 to 1983. Results indicated that using such a system was more effective and produced higher student achievement than prior methods such as informal observations or standardized assessment. In an RtI framework, information gained from progress monitoring is important at all tiers. Since it can ultimately be the foundational resource for classification decisions, it is imperative that the interventions are carried out as recommended and that progress monitoring occurs. Progress monitoring is important because it provides the information on which decisions of classification and placement are made (Fuchs, Mock, Morgan, & Young, 2003).

One thing we do know about interventions in general is that teachers have effectively used them to help students with reading comprehension difficulties. The National Reading Panel has reviewed all the available research and determined that there are critical factors that support reading comprehension. It is imperative that we determine how interventions that have proved effective in other areas can work in the RtI framework. As we employ RtI, collaboration among educators will be critical, especially considering most research is conducted without regular education teacher collaboration (Greenwood & Maheady, 1997). It is critical to investigate whether traditional education roles are changing to meet the demand of variability in instructional practices brought on by a diverse population of students, especially those found
This study extends past research by exploring the RtI procedure further; specifically, it examines whether collaboration between an SLP and regular education teacher can provide successful classroom-based interventions in the area of reading comprehension. The collaborative process to be used includes practices that have proved to support intervention implementation. The procedure entails the following: identification of a student with a reading comprehension-only deficit; development of the intervention; implementation of the intervention; performance feedback meetings; administration of CBM-Maze to monitor student progress. This research seeks to answer practical questions about how to best implement reading comprehension interventions in the classroom using the RtI paradigm.

Specifically, the first purpose is to determine if the speech-language pathologist and teacher can collaborate to effectively develop and implement evidence-based reading-comprehension intervention in the classroom to at-risk students. The second purpose is to determine if these reading comprehension interventions can positively affect student outcomes. The following research questions will be asked:

1. Does the use of performance feedback increase teacher adherence to a collaboratively developed reading comprehension intervention?
2. Does the regular-education teacher’s attitude toward the collaboration procedure and intervention effectiveness impact treatment adherence?
3. Will at-risk children’s reading comprehension scores improve (as defined by reading comprehension measures, CBM-Maze and grades) through the application of a defined, systematic, collaborative, classroom-based intervention at Tier 2?
Chapter II

Literature Review

A critical review of the existing literature is essential to answer questions about how to best implement reading comprehension interventions in the classroom using the RtI paradigm. This review of literature is necessary for clarifying what is already known; but just as importantly, it also illuminates where research needs to go. In relationship to the proposed research study, the following five relevant issues will be reviewed: 1) reading and reading comprehension; 2) evidence-based reading comprehension interventions; 3) Response to Intervention; 4) collaborative service delivery, and 5) teacher adherence to interventions.

Reading Comprehension and Interventions

In the next three sections, reading comprehension and interventions to support reading comprehension will be discussed. The first sections reviews literature pertaining to critical theories on how children comprehend what they read culminating in national report findings of critical areas. The second section discusses the four areas critical to comprehension that were chosen for this study: vocabulary, comprehension monitoring/asking questions, inferencing/predicting, and syntax. This is followed by a summary of general reading comprehension interventions. The final section reviews literature on interventions specific to this study: vocabulary, comprehension monitoring/asking questions, inferences/predicting, and syntax.

Reading Comprehension

In order to be a good reader, several skills come into play. Researchers have investigated all aspects of reading including reading fluency, phonics, phonemic awareness, vocabulary, and comprehension to determine why some students are more successful than others. At its most simplistic, reading is the ability to decode words on a page and comprehend the text; however, comprehension is the ultimate goal of reading (NRP, 2004). It is one of the primary ways students acquire information in school. Researchers (such as Thorndike) in the 1920s and 1930s thought reading was comprised of a set of sub skills and, by teaching these skills, a person would be a successful reader
(Dole, Duffy, Roehler & Pearson, 1991). Smith (1965) reported that reading was viewed as a skill that was decomposed into subskills necessary for decoding and comprehension. In this type of instruction, it is assumed that each skill can be mastered and that the combination of all of the subskills results in successful reading comprehension (Dole et al., 1991).

More recent studies found that reading is more complex than what earlier researchers envisioned. A good reader must create a global understanding of the text instead of merely retrieving the meaning of individual words and sentences. The cognitively based views of reading comprehension emphasize the interactive nature of reading (Rumelhart & Ortony, 1977) and that comprehension is constructed from text (Rumelhart, 1980). Researchers began to discover that all readers use their existing knowledge and a range of cues from the text to comprehend (Dole et al., 1991). The cognitive theory of reading presents a different understanding of reading from the traditional view. The cognitive view assumes an active reader who constructs meaning through his interaction with the text and the background knowledge he brings to it. The cognitive view also believes a reader uses strategies to support and maintain comprehension. The traditional view of reading assumes a more passive reader who masters a large number of subskills in order to comprehend text (Dole et al., 1991).

For example, one study found a student’s success in comprehending text was based upon constructive processing (Markman, 1978). Markman found that both first- and third-grade students’ abilities to follow written directions were based on their constructive processing. Third-grade students noticed inconsistencies in instructions more efficiently than the younger students. In Markman’s study, the first-grade students processed information more superficially. They were misled into believing that they comprehended the directions, when in fact they did not. They struggled to encode and retrieve the semantic information given and were more passive than the third-grade students, who actively made mental images of the instructions and visualized the step-by-step process that would ultimately help them reach the goal. These mental images alerted the third-grade students when an inconsistency in the instructions was given (Markman, 1978).
In a second part of this study, Markman also discovered that visual models supported the children’s comprehension. She attributed this to the notion that the visual cue served as a substitute for the mental processes. The students did not have to infer mentally.

Kintsch and van Dijk (1978) further explained the mental operations underlying the processes that occur in text comprehension. They developed a processing model that explains several components of text comprehension. For example, skilled readers are capable of reducing information in the text to a gist or summary and deeming it relevant only if it supports the overall objective or goal. According to Kintsch and van Dijk, skilled readers do this only if the goal is made explicit.

Johnson-Laird (1983) found that good comprehension involves the construction of a mental model corresponding to the words in the text. Skilled readers apply a variety of strategies while they are reading and have strong language skills that support text comprehension (Johnson-Laird, 1983).

The National Reading Council report (Snow, Burns, Griffin, 1998) and the National Reading Panel report (NICHD, 2000) highlighted several intervention strategies to support reading comprehension. The National Reading Council report stated that comprehension difficulties can be prevented by actively supporting comprehension skills as well as linguistic and conceptual knowledge. The authors said it is important to include strategies to support concept and vocabulary growth; provide direct instruction on the syntax and rhetorical structures for written language; and provide direct teaching of comprehension strategies such as summarizing, inferencing, predicting and comprehension monitoring. NRP credits seven different areas that are important for reading comprehension strategy instruction: comprehension monitoring, question generation, question answering, summarization, cooperative learning, use of graphic and semantic organizers and text structure. Interventions for this study target four critical areas: vocabulary, comprehension monitoring/asking questions, inferencing, and syntax. The rationale for including each of these is discussed below.

Vocabulary and Reading Comprehension

Vocabulary has long been proven to support reading comprehension. For example, Baumann, Kame’enui and Ash (2003) found that previewing vocabulary supports comprehension of text if the
instruction builds meaningful associations to a student’s knowledge base and more than a definition is provided. In another study, Ouellette (2006) found that the depth of a student’s vocabulary knowledge predicted reading comprehension. Vocabulary is so critical to reading comprehension that the NRP included vocabulary instruction as one of the five pillars that supports reading.

In Thorndike’s (1973) study, a strong relationship between vocabulary and reading comprehension was found. Thorndike reported correlations between .66 and .75 between reading comprehension and vocabulary knowledge. Children with good, extensive vocabulary were found to perform better on reading comprehension measures than children with less extensive vocabulary. In this study, there was a clear indication that the relationship between reading comprehension and vocabulary was strong.

Nation and Snowling (1998a) in their three part study found that skilled comprehenders and poor comprehenders differed on semantic fluency tasks as measured on the Word Association subtest of the Clinical Evaluation of Language Fundamentals-Revised (CELF-R; Semel, Wiig, & Secord, 1987). Although the two groups were matched for decoding ability on a non-word reading list, the poor comprehenders had poorer performance on the task that tapped semantic fluency. Semantic fluency tasks target the rapid recall of related vocabulary words. Nation and Snowling concluded that despite having adequate decoding skills, poor comprehenders had more difficulty recalling associated words due to their limited vocabulary. The researchers determined that good comprehenders had an easier time connecting vocabulary words from the same category than did poor comprehenders. This ultimately led to better text comprehension.

Goerss, Beck and McKeown (1999) investigated the use of an intervention that targeted modeling word-meaning acquisitions. They evaluated the effectiveness of the students’ ability to determine word meaning from context; they measured the effectiveness using a pre- to post- intervention word-meaning acquisition task. The five subjects were fifth- and sixth-graders identified as being one and a half years behind peers in reading. They also performed in the bottom five on the vocabulary subtest of the Gates MacGinitie Reading Tests. The intervention consisted of the researcher walking the child through the thinking process of using the context to help define an unknown word. A word was provided in context
with choices given for its meaning. The child was asked which one of the choices defined the word. The goal of the intervention was to allow students to improve their use of the context to justify the meaning of a word. The researcher did this through modeling and asking questions. The researchers found that the intervention was effective in helping students use the context to define words. This was evident in the responses the subjects gave from their pre- to post-intervention scores on the word-meaning acquisition task. In addition, four of the five students independently engaged in the steps modeled through the intervention during the post-test. Using a think-aloud task, the students illustrated their reasoning for choosing a word. They also self-corrected their mistakes when they realized their initial choice didn’t make sense and made generalizations about the definitions of unfamiliar words. The authors concluded that teaching children to use context to define unknown words supports vocabulary development as well as reading comprehension.

Lervag and Aukrust (2010) found that although individual differences in decoding skills and vocabulary predicted initial reading comprehension skills, only a child’s vocabulary predicted the later growth of reading comprehension skills. In their longitudinal study, they investigated the roles of decoding and vocabulary skills as predictors of reading comprehension in first- and second-language learners. The subjects in their study (198 L1 and 90 L2) were tested four times in 18 months in areas of reading comprehension, vocabulary breadth, vocabulary definition and word decoding. In their study, vocabulary was a stronger predictor of growth in reading comprehension among the L2 learners than among the L1 learners. However, they concluded that vocabulary was a critical predictor of the early development of reading comprehension abilities in both groups of children. Limitations in the vocabulary skills in the L2 learners explained their lag in developing reading comprehension skills. As their decoding skills became more proficient, the difference in vocabulary skills between the two groups of children became increasingly more important in determining later reading comprehension skills.

Studies investigating the role of reading comprehension and vocabulary have often examined how children use context to understand unfamiliar words. Stahl and Fairbanks (1986) reviewed 52 studies investigating the relationship between reading comprehension and vocabulary. Through their meta-
analysis, they found that children with stronger vocabulary skills used their knowledge of the context to determine the meaning of unknown words more so than children who scored lower on expressive and receptive vocabulary tasks. The children with the stronger vocabulary skills performed better on reading comprehension tasks than children with the weaker vocabulary skills.

Nation and Snowling (1998b) conducted two related studies with ninety-two 7- to 11-year-old children. The first examined word decoding/recognition; the second examined vocabulary skills. In these studies, the children were defined as good readers, poor comprehenders or children with dyslexia. The two studies took into account children’s word recognition skills and vocabulary skills by investigating individual differences in how the subjects used context to recognize unfamiliar words, which ultimately leads to better comprehension. In Study 1, the subjects were asked to read words in isolation and then read the same words in context. Nation and Snowling found that both decoding and comprehension abilities were related to improvements in reading accuracy with context. However, the ability of the child to use context was a key predictor of his ability to comprehend the text. Moreover, correlations between different reading skills and the benefit of reading in context were positive, indicating that the skilled readers made greater improvements with context than the less-skilled readers. The researchers found that the good readers’ stronger vocabulary skills gave them an advantage over the poorer readers, allowing them to use context more to support their reading comprehension. The subjects’ understanding of words and how they are used in context provided a framework for better comprehension and word decoding.

Nation and Snowling’s second study supported these findings. Children who had dyslexia but normal language comprehension skills exhibited more contextual facilitation than skilled readers. The researchers hypothesized this is because the dyslexic readers had to rely on the context when coming across an unknown word, whereas the skilled readers did not have to use this strategy as often because of their fluent decoding. Skilled readers, on the other hand, used context more than the children with poor comprehension. These researchers determined that children who are less aware of contextual information are less likely to show growth in vocabulary or general knowledge. In turn, their reading comprehension
will suffer. More importantly, Nation and Snowling’s data indicated that not only would the comprehension of poor comprehenders suffer, but also their development of word decoding or word recognition. They concluded that, when coming across a word in isolation, poor comprehenders will have little choice but to attempt to use a decoding strategy. However, if the same words were presented in context, the child would have more tools: the phonological pattern of the word and the context. Poor comprehenders had more difficulty integrating incomplete phonological information with semantic and syntactic cues garnered from context because of their weak vocabulary and syntax skills. When coming across an unfamiliar word, children with decreased vocabulary skills, as determined by a battery of standardized tests, did not use their knowledge of word meanings to help determine the unknown word; children with good vocabulary skills did. This ability supported their overall comprehension of the text.

A student’s ability to obtain new information through reading partly depends on the prior knowledge he brings to the text (Duke, Pressley & Hilden, 2004). Having prior knowledge on a topic increases the number of words that child has access to in that area. Duke et. al (2004) found that by having prior knowledge of a topic, children used mental pictures, vocabulary and ideas to support their comprehension. On the contrary, they found that children who did not have significant background knowledge on a related topic could not relate to the text, which hindered reading comprehension. Children from low socioeconomic backgrounds or different cultures are at risk for poor reading comprehension skills because they often lack the shared knowledge and experience of their peers. Even if children are good decoders, their reading comprehension may suffer due to lack of vocabulary and background knowledge on a given topic (Stahl, Hare, Sinatra & Gregory, 1991).

In summary, studies have shown that there is a relationship between reading comprehension and vocabulary. Children with stronger vocabulary skills use context clues to help support their reading comprehension. Children with vocabulary deficits have difficulty understanding text and using context clues to support their reading comprehension. Children’s background knowledge on a topic supports overall text comprehension because they have been exposed to the vocabulary related to the topic.

*Syntax and Reading Comprehension*
Syntactic awareness also can impact a student’s reading comprehension. Syntactic awareness is the ability to reflect upon and manipulate the grammatical structure of sentences (Bowey, 1994). Some argue that the inability of some readers to derive meaning from individual sentences is an obstacle in text-level comprehension (Scott, 2009). The sentences that children are asked to read and write are different from the sentences they hear and say (Scott, 2004; Scott & Windsor, 2000). In a 2004 review of research on the relationship between syntax and reading,

Scott wrote:

*It is relatively easy to establish an association between syntactic ability and reading. By way of contrast, it is exceedingly difficult to understand the true nature of this relationship. Syntax-as-knowledge is difficult to isolate from syntax-as-process, and any one syntactic structure or task that might be chosen for study is a small slice of the entire syntactic faculty.* (p. 354)

Scarborough’s 1990 study investigated the rapidly changing language skills of 2 ½-year-old children. She found that those who later developed reading disabilities were deficient in the length, syntactic complexity, and pronunciation accuracy of their spoken language, but were not deficient in lexical or speech discrimination skills. When the children who later developed reading disabilities were 3, they began to show receptive and expressive language deficits. When these children were re-evaluated at the age of 5, they demonstrated weaknesses in phonemic awareness activities and object naming. Scarborough found that the deficits in the children’s early syntactic proficiency accounted for differences in grade 2 achievement when differences at age 5 were statistically controlled.

Creaghead and Donnelly (1982) compared good and poor readers’ listening comprehension to their reading comprehension on the *Gates-MacGinitie Reading Tests*. They further analyzed specific linguistic factors that may contribute to difficulties in both listening and reading comprehension. Eighty (80) third-grade children were divided into two groups of 40 (high comprehenders/low comprehenders) based upon their reading comprehension scores. The researchers found that the poor readers’ listening comprehension scores for the stories were significantly lower than those of the good readers, indicating
that a more general language comprehension deficit may contribute to reading failure. Analysis revealed that children had more difficulty in decoding information in subordinate clauses, indicating that superordinate-subordinate information coding is one language factor influencing comprehension difficulty. By showing the discrepancy of poor readers’ scores for superordinate and subordinate information, these researchers found additional evidence supporting the relationship between children’s syntactic comprehension and reading comprehension. Comprehending information in the subordinate clauses was more difficult for poorer readers. They also examined differences in comprehension of text containing a relative or adverbial clause. Good readers’ listening and reading comprehension scores were similar when relative clauses were in the text. However, poor readers’ scores dropped from 93% for listening comprehension to 79% for reading comprehension. The results for adverbial clauses were slightly better for both good and poor readers. The researchers concluded that poor readers have more difficulty extracting important information from relative and adverbial clauses during reading, leading to possible comprehension breakdowns. The researchers concluded that it may be important to consider clause type and clause placement when determining why comprehension breakdowns occur.

Nation, Clarke, Marshall, & Durand (2004) found that children with poor comprehension performed more poorly on several language measures, including syntax. Scores on language assessments of children with poor comprehension skills were compared to the scores of a control group (good comprehension skills). In their study, the poor comprehenders performed less well than the control children on all language measures (semantic skills, morphosyntax and broader language skills). The groups did not differ in terms of phonological skills. These researchers concluded that poor comprehenders have less well developed language skills than good comprehenders across all domains but phonology. These results support research by Bentin, Deutsch, and Liberman (1990) and Nation and Snowling (2000) who found that students with comprehension-only deficits but intact pseudo-word reading made more errors on measures of syntax than students with good comprehension skills.

Cain and Oakhill (2007) reviewed the evidence for a relationship between sentence-level comprehension and reading comprehension difficulties based on syntactic knowledge and syntactic
awareness. According to these researchers, the studies related to syntactic awareness suggest that children with poor text comprehension have difficulty correcting sentences with incorrect word order or grammatical errors.

Other evidence indicates that children with language impairments have difficulty comprehending specific syntactic forms. Morphology, or verb tense and agreement is one such area (Rice, 2003). Sentences comprised of long-distance dependencies such as reflexive pronouns, passive voice and object-relative clauses are also difficult (Scott, 2009). These language deficits are a result of a domain-specific deficit as opposed to a domain-general cognitive deficit (Silliman & Scott, 2006). Children who have more difficulty comprehending sentences at the same level as their peers are at risk for reading comprehension problems, especially in the upper grades, when complex language structures comprise most content area texts (Scott, 2009).

In summary, there is a sufficient body of research to conclude that readers with poor syntax understanding will have difficulties with reading comprehension. Scott (2009), through her research, concluded that sentence complexity can create comprehension problems for some readers. The ability to understand a complex sentence supports comprehension. For example, poor comprehenders in later elementary school scored lower on semantic and syntactic tasks compared to peers with average reading comprehension (Catts, Adolf & Weismer, 2006). Scott argues that understanding syntax is critical to comprehending text books that contain more complex sentence structures than oral language. Syntactic structures that make sentences more complex such as adverbial clauses, relative clauses, verb tenses and long-distance dependencies create reading comprehension hurdles for most readers, but especially for poor readers.

Inferencing/Predicting and Reading Comprehension

Addressing inferencing, Barnes, Dennis, and Haefele-Kalvaitis (1996) found that the ability to make inferences develops with age, independently of the influence of concept knowledge. Their study investigated two issues important to understanding the development of knowledge-based inferencing: how children of different ages use an available knowledge base to make two types of inferences important...
for comprehension, and how the accessibility of an available knowledge base is related to inferencing in children of different ages. In their two experiments, they taught students new information before the children listened to a multi-episode story. The children had to make inferences from the story that drew from the new information. The results showed that providing children with the same information (regardless of age) did not lessen age-related differences in either coherence or elaborative inferencing. The researchers found that readers benefited more from knowledge that was easy to access than from embedded information; they were twice as likely to make inferences during comprehension activities with the former. Ease of access to that knowledge was more important for coherence inferencing in younger children. In general, the test subjects made more coherence inferences than elaborative inferences during reading tasks. For example, a cohesive inference is the ability to surmise that John and he are the same person in these two sentences: John walked Mary home. He wanted to make sure she got home on time. Cohesive inferences usually connect parts of a passage together to help maintain meaning. Elaborative inferences are not necessary to maintain meaning but enrich the story or passage. The information usually stems from what the reader brings to the text. An example of an elaborative inference is: The gonging noise bellowed throughout the small town. In this instance, the reader begins to visualize an instrument that makes a gonging noise such as a bell.

Good readers access their prior knowledge to make inferences, using it to predict or infer what the text will discuss. In several research studies conducted at the University of Illinois Center for the Study of Reading, Anderson and Pearson (1984) found that children who cannot access their prior knowledge during reading have more comprehension difficulties than children who can. They summarized their findings by reporting that when good readers make inferences as they read, they are primarily driven by the information the reader brings to the text (prior knowledge). Good readers use strategies to compare new information found in the text to their prior knowledge. The ability to predict what will happen next in the story is driven by the reader’s knowledge of the topic. Pressley et al. (1992) found that teaching children to ask “Why” questions supported their ability to access prior knowledge. This strengthens their ability to understand the context and how the events and characters are related. Pressley et al. (1992),
found that these “Why” questions forced students to think about what is in the text and what they already know about the information.

Researchers have also explored the inability to make inferences in the context of reading comprehension. Oakhill (1982) found that poor comprehenders had more difficulty making inferences when reading or listening to a passage. In this study, poor comprehenders generated constructive inferences involving the integration of information from two sentences. However, compared to the control group, poor comprehenders did not incorporate general knowledge with information from the text to generate simple inferences. A more recent study investigated the generation of inferences by poor comprehenders compared to good comprehenders (Cain, Oakhill, Barnes & Bryant, 2001). They found that even when they controlled for background knowledge, the poor comprehenders generated fewer inferences than did the good comprehenders.

In summary, the ability to make inferences supports reading comprehension. Good readers employ what they already know about the topic discussed in the text in order to infer information that is not explicitly stated. They also rely on their past experience to support their understanding and answer questions when the information is explicitly not stated by the author. The ability to make inferences is a key to comprehension (Ukrainetz, 2006). The ability to make inferences involves making assumptions, predictions and understanding the text based on the information the author provides. It also supports a student’s ability to answer questions. This ability is a key component to comprehension (NRP, 2002; Snow et al., 1998).

Comprehension Monitoring/Asking Questions and Reading Comprehension

One crucial skill to achieve good comprehension is comprehension monitoring (Cain and Oakhill, 2007). Comprehension monitoring is a metalinguistic skill that allows the reader to think about what has just been read: whether it made sense, whether or not the reader liked it, what was learned, and what the main points were (Cain and Oakhill, 2007). It usually develops as a child learns to read and does not typically develop prior to reading. Many studies use the inconsistency detection task to assess comprehension monitoring. This task assesses a child’s skill at detecting inconsistencies in text. The
Inconsistencies are usually nonsense words, contradictory sentences or sentences that don’t match up to background knowledge such as, “The sun was out at night.” Researchers have found that comprehension monitoring appears to be an area of weakness for poor comprehenders. In a 1996 study, Ehrlich examined comprehension monitoring by investigating the ability of good comprehenders and poor comprehenders to detect inconsistent anaphors in expository texts. An anaphor is a device that maintains cohesion between sentences (for example, “he” in this example: “John is a nice boy. He helps out every day”). In this study of 12- to 15-year-old students, good comprehenders were more likely to find the inconsistent anaphor (Mary went to school with Joan. He liked to walk to school with her every day.) than were the poor comprehenders. In following up this study, Ehrlich and colleagues found that skilled comprehenders spent more time reading passages with inconsistent anaphors than did less skilled comprehenders. In this study of 10-year-olds, the skilled comprehenders looked back more to previous information when they came across an inconsistency, whereas poor comprehenders more frequently kept reading the text even though it did not make sense. The researchers concluded that good comprehenders engaged in additional processing by trying to make sense of text when there were inconsistencies (Ehrlich, Remond, & Tardieu, 1999).

In summary, readers with poor comprehension monitoring abilities will find it difficult to comprehend text. Good readers monitor their comprehension and repair any breakdowns they have as they read. The NRP (2000) reported that strategies to support comprehension monitoring helped children throughout all grades and helped them become aware of their comprehension difficulties. Comprehension monitoring is an important skill that supports overall text comprehension for children.

**Critical Areas for Reading Comprehension and Related Interventions**

Comprehension is a complex cognitive process and is affected by many factors such as the reader, the text and the context (McKeown, Beck & Blake, 2009). Comprehension breakdowns do occur for a variety of reasons. Sometimes the student does not get a complete and integrated representation of the text’s meaning and misses the point or message of the text (Cain & Oakhill, 2007). Many children with reading comprehension difficulties develop accurate word-reading skills but experience a failure to
comprehend (Cain & Oakhill, 2007). The student with poor comprehension skills experiences difficulty acquiring new information, which leads to academic failure.

Research has shown, however, that interventions can improve reading comprehension in children. For starters, there are general cognitive strategies that support reading comprehension, as described briefly in the following section. But many children require more complex and specific interventions into four critical areas of reading comprehension chosen for this study. These areas —— vocabulary, syntax, inferencing/predicting and comprehension monitoring/asking questions —— are explored more deeply in the next section.

*General Reading Comprehension Interventions*

Sporer, Brunstein and Kieschke (2009) evaluated the effect of teaching specific cognitive strategies on reading comprehension. While it was not classified solely as an intervention study, its findings are applicable to support reading comprehension intervention. In the study, 210 typically developing third-to sixth-graders from several elementary schools were chosen as subjects. The students were randomly assigned to a control group or an experimental group. In the control group, the students received typical reading comprehension instruction by their regular teacher. The intervention group received 7 weeks of strategy instruction in small groups after regular lessons. Two strategy instructions were delivered each week. The children received explicit instruction on making predictions while they read, the importance of question generating and how to summarize the text. Compared to the control group, the intervention students’ posttest scores indicated that they used the strategies more often. They also scored higher on reading comprehension measures. The control students showed very limited improvement in their reading comprehension.

Graves (1986) investigated the use of direct instruction on identifying main ideas, as well as direct instruction combined with self-questioning and self-monitoring. He counseled the students in the direction instruction/self-question/self monitoring group to ask themselves, “Do I understand what the whole story is about?” as they read. The students were shown how to record their answers as they read. Student data were recorded every week, but the reading conditions changed each week. During the first
week, the students read passages aloud; during the second week, the students read the passages silently; and during the third week, the children could read the passages aloud or silently. Under all three conditions, the children in the group employing direct instruction with self-questioning and self-monitoring outperformed those in the direct instruction group, who outperformed those in the control group. Researchers concluded that direct instruction combined with a self-monitoring strategy improved children’s ability to summarize text.

Gersten, Fuchs, Williams & Baker (2001) reviewed twenty years of research on comprehension instruction for students with learning disabilities. They reported on a seminal study conducted by Wong and Wilson (1984). Wong and Wilson’s study included 28 children with learning disabilities and 28 children who served as a control group. The control group was comprised of fifth- and sixth-grade students who demonstrated normal reading skills on a reading assessment. The children with learning disabilities were from grades fifth, sixth and seventh and demonstrated below grade-level reading scores. Initial results of their two-part study revealed the children with a learning disability did not approach text strategically. When reading a disorganized text, the students did not recognize that the text was not coherent, nor could they separate the text into segmented but related pieces. The second stage of their study, the intervention stage, revealed success in teaching interventions targeting the organization of text. With individual instruction on how to organize a text, the students understood what constituted an organized paragraph. This study demonstrated that instruction can improve strategic processing for students with learning disabilities. Although this study showed that intensive intervention could affect the reading skills of students, the intensive amount of daily intervention is not user-friendly to the classroom.

Gajria and Salvia (1992) investigated teaching children how to summarize a passage. In their study, they taught students with learning disabilities in grades 6 through 9 five rules for summarizing text to improve their reading comprehension. Thirty students characterized as poor comprehenders were assigned to experimental or control treatments. Students in the experimental group were instructed in small groups that incorporated explicit instruction on the summary rules. After an explanation for learning the summarization strategies was presented, the first summarization rule was modeled, and students practiced
used this rule on paragraphs until reaching mastery criteria. The other rules were taught in a similar way. Results indicated that students in the experimental group outperformed the control group on summarization and answering factual questions. Also, this same group of students made significant gains on the Gates-MacGinitie Comprehension Subtest when compared to the control group.

Vocabulary Interventions

Nelson and Stage (2007) brought their research into the regular education classroom. They addressed how the effects of contextually based multiple-meaning vocabulary instruction support vocabulary knowledge and reading comprehension. In their study, third- and fourth-grade classes were divided into treatment groups and non-treatment groups. The treatment groups received contextually based vocabulary intervention that was embedded in the Language Arts instruction provided by the regular education teacher. The non-treatment group received only typical instruction offered in the regular Language Arts class. The students in the contextually based vocabulary intervention classes made statistically significant gains in both vocabulary knowledge and reading comprehension compared to students who were in the control group.

Researchers have investigated vocabulary interventions. Pany, Jenkins and Schreck (1982) conducted three experiments to determine the effects of vocabulary instruction on the pre- to post-vocabulary scores of three different groups of children. All three experiments used the same instructional conditions. The only component that changed was the subject. In the first experiment, 12 typical fourth-grade students were used. The second experiment used children with a learning disability and the third experiment used children receiving remedial reading instruction as its subjects. Four instructional methods were used: no meaning (student read the written word on an index card), meaning from context (the word was used in a sentence), meaning of the word given using a synonym, and meaning practiced in several sentences. The children received instruction for three days. On each day, 8 words were taught, two under each instructional method. After each session, a post-test was administered comprised of the words used during the instructional period. All subjects learned and retained the greatest number of vocabulary words during the meaning practice condition. They learned fewer words when told the
synonyms only. The authors also noted that the meaning practice condition required more direct instruction by the teacher than the other conditions. They could not conclusively rule out that the direct instruction supported the children’s ability to learn and retain the words more so than the instructional method (practice). The authors also reported that the children with learning disabilities required more repetition and instructional time before demonstrating significant vocabulary growth.

In their study, Ruston and Schwanenflugel (2010) investigated the effectiveness of a conversation intervention on the expressive vocabulary growth of prekindergarten children. In their study, the children were randomly assigned to a control group or an experimental group. The children in the experimental group participated in a 10-week intervention, having 25 minutes of individual conversation with an adult two times per week. The conversation was scripted to contain rare words, linguistic recasts and open-ended questions. Recasting occurred when the children used simple words or used a grammatically limited sentence. Results indicated that this pullout, intensive conversation was an effective strategy for improving the vocabulary of the children, especially those with low vocabulary skills. However, the intervention did not improve the use of vocabulary in the language samples for the children in the experimental group.

Hadley, Simmerman, Long and Luna (2000) investigated the effectiveness of a classroom-based intervention in improving the vocabulary and phonological awareness skills of kindergarten and first-grade children. In their study, two classrooms served as a control group and two classrooms served as an experimental group. In the experimental classrooms, a speech language pathologist taught in the classrooms 2 1/2 days per week. Her primary responsibility was planning activities to meet the communication needs of the students. The SLP and teacher developed lesson plans that embedded vocabulary and phonological awareness activities. The lesson targeted 20 vocabulary words weekly that were embedded into the thematic units. The SLP also led the students in a weekly 25-minute phonological awareness activity that introduced individual letters and highlighted two pairs of letter-sound associations. In addition to these two activities, there were several incidental learning activities that targeted phonological awareness skills such as rhyming, identifying beginning sounds, segmenting
and blending. At the end of the six month intervention, the children in the experimental group made higher gains in receptive vocabulary, expressive vocabulary, beginning sound awareness and letter-sound associations.

Nicholson & Whyte (1992) found that some children require direct instruction in order to learn the meanings of a variety of words. Direct instruction can include aids such as semantic maps or graphic organizers to support students’ comprehension. Bos and Anders (1990) investigated the effects of instructional aides on content area comprehension. Subjects in their study were 61 junior high students with learning disabilities. The students were randomly assigned to one of four intervention groups. The three interventions were semantic mapping, semantic feature analysis and semantic/syntactic feature analysis. The fourth group received a definition instruction approach. Content area vocabulary was used during the intervention phase which lasted for 7 weeks. Each session lasted 50 minutes. The students read grade level passages and then answered a series of multiple choice questions targeting text information. The subjects were asked to recall information from the text and write what they remembered. On both measures of comprehension, students in the experimental groups outperformed the direct instruction group. The researchers concluded that children with learning disabilities can be taught strategies to support their reading comprehension.

Scruggs et al. (1987) studied the use of mnemonic devices to support the learning of science concepts. Twenty-four high school students with learning disabilities were randomly assigned to treatment conditions. Students read passages with either mnemonic or non-mnemonic symbolic pictures of minerals. The students scored higher on recognizing minerals on post-test measures when mnemonic devices were used.

In a recent study, Hawkins, Musti-Rao, Hale, McGuire and Hailley (2010) found an increase in students’ abilities to answer reading comprehension questions when a vocabulary previewing component was added to a listening previewing intervention. In the study, 21 fourth-grade students from the same classroom were used as subjects. The students were exposed to three different experimental conditions: silent reading control, listening preview and listening preview plus vocabulary preview. The researchers
examined the effects these three conditions had on reading comprehension and vocabulary. The students were asked to read one passage, answer 10 reading comprehension questions and complete a vocabulary-matching probe during each data collection session. In the silent reading condition, the children were instructed to read silently until they completed the passage. Once they completed the passage, they were given the comprehension questions and the vocabulary probe. They were not allowed to look back in the text. The listening preview condition consisted of oral reading with the researcher followed by the comprehension questions and vocabulary probe. In the final condition, the students and researcher previewed previously selected vocabulary words before reading the passage out loud. Once again, the students answered the comprehension questions and vocabulary probe after the reading. With the addition of the listening preview condition, students answered more factual and inferential comprehension questions correctly than during silent reading. However, the researchers found the difference to be significant only when comparing the listening preview plus vocabulary preview condition to the silent reading. They also found that results across all three dependent variables indicated that the addition of the vocabulary preview resulted in the highest levels of comprehension and vocabulary knowledge.

In summary, vocabulary interventions support children with reading comprehension difficulties. There are a variety of methods including using mnemonic devices, using context, previewing vocabulary and direction instruction. These interventions support all readers, including at-risk students and children with learning disabilities.

*Syntax Interventions*

In a study looking at the effects of syntax intervention on reading ability, Gillon and Dodd (2010) investigated the teaching of program content material and the effects of spoken language intervention on reading accuracy and reading comprehension. In their study, ten children (ages 10-12) with below-grade-level skills were subjects. The students, all of whom demonstrated severe difficulties on written and higher-level spoken language tests, were divided into two groups. The first received interventions targeting phonological awareness and then semantic-syntactic skills; the second received the same interventions in reverse order. The researchers found that the phonological and semantic-syntactic
difficulties of students with reading disabilities can be targeted through interventions. The interventions resulted in improvements in these skills, which had positive effects on reading accuracy and reading comprehension. Results indicated that training in phonological awareness skills had a greater impact on reading accuracy than training in semantic-syntactic skills. However, both interventions contributed to improved reading comprehension.

Cirrin and Gillam (2010) reviewed research studies written over the past 20 years to determine if the studies were of high quality (using experimental designs considered to be reliable and valid) as well as to document the effectiveness of language intervention with students exhibiting spoken language disorders. Out of 495 studies found in their initial computer search, only 21 met all four of their selection criteria (a focus on experimental measures of the outcomes of language intervention practices for students with spoken language disorders; inclusion of either meta-analysis or randomized clinical trials, nonrandomized comparison studies or multiple baseline single-subject design studies; publication since 1985 in a peer-reviewed journal; and inclusion of school-age students with language disorders as a primary disability). In their review, they found only three studies of interventions designed to treat syntax and morphology in school-age students. Although the authors felt it was hard to draw compelling conclusions based on a limited number of studies, they did report that clinicians targeting syntax could expect to obtain moderately large to large effects from procedures that employ imitation, modeling, or modeling plus evoked production strategies.

In summary, research reveals that targeting syntax supports reading comprehension. Direct instruction and modeling have proved to teach syntactic skills to children.

Inferencing/Predicting Interventions

It is also critical for children to learn how to make inferences. Teachers can help students by modeling how to make predictions and conclusions during oral reading. Richards and Anderson (2003) investigated the use of direct strategy instruction on teaching inferences. They taught teachers how to help students focus their attention on explicitly stated information and modeled how to do this. The teachers were also shown how to teach the students to use this information to make connections between
what is known and what is not known. Once they were taught how to make these connections, the students explained or gave a reason why they made this conclusion. Students ultimately performed better on implicit reading comprehension questions after the teachers’ direct instruction of the strategy. Researchers concluded that a teacher needs to ask the students questions that prompt them to come up with an answer and to support their answer with information from the text (Richards & Anderson, 2003).

Ukrainetz recommends use of an inferencing journal chart when reading (2006). She makes this recommendation based upon research conducted by Westby (2006) and Hansen & Pearson (1983). These authors found that providing students with ways to document their growth in making inferential connections, framing questions, reasoning and sharing their thinking with peers enhances their ability to make inferences. The researchers implemented a strategy that uses guided questions to prompt the students to think about what they are reading, which ultimately supports the development of making inferences. The questions were used as an instructional tool that helped the students activate their prior knowledge of a specific topic in order to comprehend the content of a story or article on the same topic. Linking new facts to prior knowledge increased the students’ inferential comprehension.

In summary, research found that direct instruction supports student’s ability to make inferences. Students who learn how to connect what is known to what is not known in the text improve their inferential comprehension skills.

Comprehension Monitoring/Asking Questions Interventions

Researchers investigating comprehension monitoring have discovered that there are strategies to help read text. Chan and Cole (1986) targeted 11-year-old students with learning disabilities in the fifth and sixth grades as well as 8-year-old regular-education students in the third grade. The two groups were matched on reading level. The researchers used a toy robot to train the students in how to remember what they read. Narratives were used that consisted of short passages of descriptive information. Students were assigned to one of four experimental conditions. The first condition required the students to generate questions about the content of each paragraph they read. In the second condition, they were taught to underline two interesting words in the passage and then explain why they were interesting.
The self-questioning and the underlining techniques were taught in the third condition. In the fourth control condition, students simply reread the story. After each passage, students were given multiple-choice questions and were provided feedback about their responses. Results indicated the usefulness of training for students with learning disabilities. Students in all three experimental groups performed at higher levels on the reading comprehension test than did those in the control group. This indicated that the students benefited from explicit training since the control group, without training, did not use strategies that would have helped them understand the text. On the other hand, for the students without learning disabilities, there were no significant differences among the three conditions in which strategies were taught and the control condition. The researchers suggest that the children without disabilities naturally use a strategy even when they are not explicitly instructed.

Monitoring comprehension supports reading comprehension. It allows the reader to self-correct errors during the reading process. Research has shown that strategies can be taught to children with learning disabilities and to typically developing students.

In summary, comprehension monitoring is a key skill good readers use to repair comprehension breakdowns. Research has shown that there are effective interventions to support children’s use of comprehension monitoring. Explicit instruction has taught children how to use this strategy when reading.

Interventions targeting vocabulary, syntax, inferencing and comprehension monitoring do improve a student’s reading comprehension skills. Most studies in this area have been completed outside of the regular education classroom and implemented by people other than the classroom teacher. Under the RtI paradigm, children who experience difficulty in the regular classroom (Tier 1) begin receiving support in Tier 2. This support usually falls in the hands of the regular education teacher. Although reading comprehension interventions have been investigated, no research studies were found that examined reading comprehension interventions being implemented by the classroom teacher under this model.

*Response to Intervention*

Approximately ten years ago, government mandates ignited the discussion of Response to Intervention
and brought it to the forefront as a model capable of addressing the decline in the reading performance of students. Its purpose was to provide quality instruction to all students, eliminate the over-identification of children being placed in special education and support students at-risk for learning disabilities. Although it garnered much enthusiasm by many educators, few research studies have investigated its effectiveness. This is a key weakness in the RtI literature ---- there is much more anecdotal support than research-based evidence.

There are many different structures for RtI. The general framework of RtI is a multi-tiered model of instruction and intervention that provides increasingly intensive support to the most academically vulnerable children (Fuchs & Deshler, 2007). There are several advantages in using a multi-tiered approach to remediate a child’s academic and/or behavioral difficulties (Gresham, 2007). Gresham (2007) identifies these advantages as early identification; risk versus deficit approach; reduction of identification biases; and focus on student outcomes. This multi-tiered model was also supported by the National Research Council Panel on Minority Overrepresentation (see Donovan and Cross, 2002) and the National Summit on Learning Disabilities (see Bradley, Danielson, and Hallahan, 2002). These organizations recognized the need for a new model to help address the overwhelming number of students experiencing learning difficulties (Kratochwill, Clements & Kalymon, 2007).

There are usually three to four tiers occurring within a multi-tier model (Beninger, Stage, Smith, and Hildebrand, 2001). The number of tiers varies depending upon what author or organization is describing the RtI model (Kovaleski, 2007). For the purpose of this paper, the three-tiered Ohio’s Integrated System Model (OISM) will be used.

High-quality instruction in general education becomes the most important factor when implementing RtI (Stecker, Fuchs & Fuchs, 2008). The first tier involves evidence-based instruction that occurs in the classroom (Stecker et al.2008). It is the most critical tier because it provides the core instruction on which the other tiers are based (Kovaleski & Glew, 2006). The teacher primarily is the one involved in direct instruction at Tier 1. Marzan, Gaddy & Dean (2000) found that the more time students were engaged in reading under the direct instruction of a teacher, the greater their progress. Supporting this
recommendation, Arndt & Crawford (2006) found that a minimum of 90 minutes per day of direct reading instruction is recommended to see progress in students’ reading skills. Although researchers agree that the amount of time is a critical element to reading instruction, there is controversy in the literature over how to implement evidence-based instruction in the classroom. When teaching new knowledge skills, a group of three or four students is most effective (Elbaum, Vaughn, Hughes & Moody, 1999). However, consistent use of small groups reduces direct instruction time given by the teacher, which is a key predictor of student success (Rosenshine & Stevens, 1986). Bursuck and Damer (2007) added instructional supports such as unison response and systematic corrections to group instruction. These techniques brought the advantages of a small-group setting to a large group, allowing students to receive the same instruction benefits. If a student exhibits difficulty learning in the regular classroom at Tier 1, lack of instruction and ineffective instruction must be ruled out (Gersten & Dimino, 2006). Tier 1 instruction should meet the needs of all students, be research-based, and be implemented systematically (Stecker et al. 2008).

Tier 2 instruction is designed to support the approximately 5% to 10% of students who had difficulty at the Tier 1 level of instruction. Children in this group are those who fall below the benchmark on universal screening measures. For core reading programs, Tier 2 should include systematic explicit instruction aligned with the core reading program (Gersten et al. 2009). The Institute for Education Sciences (IES) recommends that small-group instruction of three or four students be implemented at Tier 2. The instruction should be provided three to five times per week between 20-40 minutes. Nuthall (1999) found that a minimum of four exposures to new information is needed in order for it to be integrated into background knowledge. This information has to be presented no more than two days apart. These children are provided interventions that mirror the teaching done at Tier 1; however, they are provided additional support through interventions such as small-group instruction, an increase in frequency and/or intensity of instruction or individual support. While there is no research that explicitly addresses successful teaching methods for Tier 2, it is often recommended to use Tier 1 methods but with more frequency and intensity. The interventions at this level should be data-driven, responsive to student
needs and research-based.

In a three-tiered model, the third tier is usually designed to provide individualized, intensive interventions. Progress monitoring and data collection are crucial to determine the need for special education services. Approximately 3% to 5% of all children require Tier 3 level of support.

Seeing the need to evaluate the effectiveness of a tiered model of instruction, Bursuck et al. (2004) implemented Project PRIDE. Project PRIDE is a model whose goal is to prevent reading failure by using a combination of systematic, explicit instruction in phonemic awareness and phonics with a total classroom reading program; a multi-tiered teaching approach; data-based decision making; and professional development that includes ongoing, on-site coaching (Bursuch et al., 2004). Their study took place in three inner-city schools for two years. One served as a control school; it did not implement Project PRIDE but continued its traditional reading instruction. Results indicated that students in the experimental schools achieved significantly higher scores on the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) oral reading fluency and nonsense word fluency measures. Students in all three tiers demonstrated significantly more reading growth than the students in the control school.

Vaughn et al. (2009) addressed a group of students they called “Low Responders.” They defined this group of children as those that had demonstrated minimal response to previous intervention when compared to their peers (high responders). Their study was a multi-year longitudinal research study investigating the effectiveness of a three-tier intervention. In the first year of the study, the first- and second-grade students from seven elementary schools received the same help with instruction provided by the research team. This instruction included professional development, use of progress monitoring data to inform instruction and in-class coaching. In the fall, the students were screened for reading difficulties and those that met the at-risk criteria for reading difficulties were randomly assigned to treatment and control groups. Students in the treatment group received intervention from the research team. The control group received traditional instruction. After this phase of the study, the students who met benchmark criteria were placed in the “high-responders” group and those that did not were placed in the “low-responders” group. The low responders received more intensive instruction that occurred in
small groups of two to four students for 50 minutes daily with a tutor trained and supervised by the research team. At the end of the two years, the researchers examined the performance of low responders relative to students who were high responders to the same secondary intervention at the end of the first year. The “low-responders” group’s scores after the second year did improve. For both passage comprehension and word identification, lower responders who had higher oral reading fluency at the end of the first year demonstrated significant gains in these two areas at the end of year two.

McIntosh, Graves and Gersten (2007) designed a descriptive study to explore the effects of a response to intervention model in classrooms of English language learners. Their study took place in four first-grade classrooms over two years. They studied gains in oral reading fluency pre- to -post intervention. Results indicated that the correlation between classroom ratings on the English Learners Classroom Observation Instrument (an instrument that defines features of Tier 2 intervention and teachers implementation of the features) and gains from pre- to -posttest on oral reading fluency probes was moderately strong for both years. The authors summarized this finding as a strong relationship between the teacher’s adherence to Tier 2 interventions (as defined by the English Learners Classroom Observation Instrument) and end-of-first grade oral reading fluency. A second finding from this study was a strong correlation between the number of students below DIBELS benchmark at the end of first grade and the teacher rating on the amount of intervention required for the at-risk students. The teachers indicated that the at-risk students required intensive interventions.

Researchers are beginning to look at how to implement reading strategies into the RtI model. Most of these studies investigate reading intervention targeting fluency and decoding but not reading comprehension. For example, Denton, Fletcher, Anthony and Frances, 2006, evaluated the effects of an intensive tertiary reading intervention. In their study, 27 students with severe reading difficulties and disabilities received a 16-week intensive intervention targeting decoding and fluency skills. This intervention occurred only after the students did not respond adequately to primary or secondary tiers of intervention. For the first 8 weeks, the students’ decoding skills were targeted using a commercial program called PhonoGraphix. Fluency was targeted the second eight weeks using the commercial
program Read Naturally. The 16-week intervention resulted in significant improvement in reading decoding and fluency. Although comprehension was not specifically targeted, the students’ comprehension skills also improved significantly as measured by post assessments.

Although the above studies indicate positive outcomes for students using the RtI model, interventions in these studies were conducted mostly by researchers or people trained by the researchers. Importantly, few were conducted by the classroom teacher. This current study will advance the research by creating a procedure that can be implemented by a classroom teacher. Also, studies have not addressed the implementation of reading comprehension interventions using the RtI model. Reading comprehension is the ultimate goal of reading, and supporting at-risk students using the RtI framework demands investigation.

The Components of an Effective Response to Intervention Model

In his guide to RtI, McCook (2006) outlines six components for a successful RtI model: (1) Universal Screening; (2) Baseline Data; (3) Measurable Terms; (4) Accountability Plan; (5) Progress-Monitoring Plan; (6) Data-based decision making.

Universal Screenings and Baseline Data

One strategy to identify students who are at-risk for reading comprehension difficulties is the use of a universal screening tool. A universal screening tool is used to identify as many children truly at risk as possible (i.e., true-positives) while limiting the number of children falsely identified (i.e., false-positives) (Catts et al., 2009). By testing all students in a given grade, a teacher or other educator can determine which students fall below the benchmark criteria for the grade. Children who fall below the benchmark are considered at-risk and begin receiving Tier 2 interventions. The score on the universal screening provides a baseline to measure progress or the effectiveness of the intervention.

Concerns over the predictive validity of universal screening to identify children at risk for reading difficulties led Catts et al. (2009) to conduct a longitudinal study researching a common screening instrument. These researchers investigated the presence of floor effects of the DIBELS (Good & Kaminski, 2003) and the reading comprehension subtest of the 10th edition of the Stanford Achievement
Test (SAT-10) Harcourt Educational Measurement, 2003. The scores of 18,677 participating students in kindergarten through third grade were used. The results showed that DIBELS measures were characterized by floor effects in their initial administrations and that these effects reduced the predictive validity of the measures. The researchers determined that the results were affected by the age of the students, as well as when the tests were administered. Often DIBELS is administered early in the fall, when some of the children have not been exposed to the task being assessed. If it were administered later, once students were exposed to the task, Catts et al. predicted that more optimal screening accuracy would be achieved. The researchers acknowledged one flaw to this approach: the delay in administration would result in children who were truly at risk not receiving intervention as quickly. The researchers concluded that supplementing the information gained from a universal screening with authentic assessment would either support or negate the results obtained from the universal screening tool and would be a better predictive factor.

Curriculum Based Measurements (CBM) are commonly used universal screening tools in schools. They are used to assess student’s progress in core areas such as mathematics, written expression and spelling that can be reliably and validly used to make instruction decisions (Stecker, Fuchs, & Fuchs, 2005; Deno et al., 2009). Deno (1990) found through his work that CBM is an essential component of a problem-solving approach (such as RtI) that evaluates a student’s growth from instruction. CBM was investigated by Deno as an approach to measuring the academic growth of individual students. The results of Deno’s criterion validity studies indicated that all of the curriculum-based measures (maze, reading fluency, writing fluency and spelling) were highly correlated with performance on the standardized, norm-referenced tests except for the word meaning task. Deno also felt that in order for teachers to use curriculum-based measurement frequently, the tool had to be efficient, simple, easily understood and inexpensive (Deno, 1985).

Researchers have investigated the merits of CBM. One of the initial experimental studies was conducted by Fuchs et al (1984). In this study, the researchers detected significant achievement effects in reading for students when their teachers monitored their progress using CBM. In this study, 39 special
education teachers were randomly assigned to either a progress monitoring group or a conventional special education group where progress was not routinely monitored. The teachers in the experimental group measured the students’ oral-reading fluency twice weekly, compared the progress and made instructional modifications when progress was not significant. Trainers instructed by the researchers met weekly with each group of teachers.

Jones and Krouse (1988) also reported a positive effect on reading achievement when teachers applied CBM. In their study, 10 student teachers monitored oral-reading fluency, vocabulary skills and reading comprehension. The student teachers applied CBM reading procedures for students with a learning disability. The student teachers met with their supervisors weekly to discuss the data and made instructional changes if the progress was not significant. The results from this study indicated that the students whose progress was monitored improved significantly on pre- to post-test oral reading fluency probes.

Progress monitoring is used to guide students’ performance on scheduled, research-validated measures. Students can be referred to special education only after high-quality, evidence-based interventions have been implemented and the child’s progress has been monitored.

In one study (Griffiths, VanDerHeyden, Skokut & Lilles, 2009) the effectiveness of using a single CBM passage for progress monitoring at specific periods was investigated. Fourth-grade students who fell below grade-level criteria on a reading screening, read fewer than 70 words per minute and were proficient speakers of English were provided with reading fluency intervention. The intervention consisted of reading passages following repeated reading guidelines (modeling, guided practice with immediate error correction, independent timed practice, an opportunity to obtain a reward for beating the previous best score, word recognition and comprehension quiz, and an error correction component for comprehension). For this study, two methods of passage equation for progress monitoring were compared. A familiar passage and a novel passage were used to collect reading fluency data throughout the intervention. Both progress monitoring passages reflected gains across intervention sessions, and the
researchers found both methods useful in the identification of students who met the proficiency criterion on the words read per minute CBM.

In summary, CBM is a universal tool used to screen students’ skills in a variety of academic areas. It has been proved to be a valid and reliable tool to monitor students’ progress. Those monitored frequently showed improvement in academic areas such as reading and writing fluency.

*Implementation Adherence and Student Outcomes*

A measurable term is defined as the identification of a problem area for either an individual student or a group of students (McCook, 2006). Through the use of universal screening tools, a problem area is defined. The IES recommends that the problem area align with the core reading program. Once the problem areas are identified, an evidence-based intervention is implemented. An accountability plan is developed that specifies critical features used to monitor intervention fidelity, including the type, duration, intensity, setting and the educators responsible for each intervention component (McCook, 2006).

A key component of the accountability plan is treatment adherence, which helps guarantee that the intervention is implemented with fidelity. The efficacy of an intervention is dependent upon the extent to which it is implemented correctly and consistently. (Noell, Duhon, Gatti, & Connell, 2002).

Intervention implementation has been positively shown to be linked to performance feedback (Mortens, Hiralall & Bradley, 1997, Mortenson & Witt, 1998, Noel et al., 2001, Noell et al., 2002). Several studies conducted by Noell and colleagues explored the importance of performance feedback to enhancing implementation fidelity. Noell et al. (2000) developed two strategies for increasing the accuracy with which teachers implemented a peer tutoring intervention. Initially, teachers were asked to implement the intervention as designed. Data were collected on implementation fidelity. When a downward trend in treatment implementation occurred, researchers met briefly on a daily basis with the teachers to discuss the intervention. After performance feedback meetings were held whose primary purpose was to discuss student outcomes in relationship to the intervention, four of the five participating teachers began to implement the intervention above baseline measurement. The other teacher’s
implementation improved once the principal was tapped to attend the meetings. In addition, student reading comprehension scores improved during the intervention.

In another study, Noell, Duhon, Gatti and Connell (2002) found that teachers’ implementation of a behavior management intervention improved with the addition of performance feedback meetings. Although initial implementation varied across teachers, there was a significant downward trend when follow-up meetings were stopped. When the teachers were required to attend only brief meetings to review materials, there was little effect. Implementation improved for one teacher, improved only marginally for two others and was ineffective for one. Performance feedback meetings, on the other hand, resulted in high intervention implementation. During these performance feedback meetings, discussion of children’s outcomes in relationship to treatment adherence was the primary purpose.

Burns, Peters & Noell (2008) found mixed results when investigating the use of performance feedback to enhance implementation fidelity of a problem-solving team process. Although the adherence to the steps of the team process improved, they found that more research was needed to determine treatment effectiveness and whether the intervention in the classroom was implemented correctly. This information extended existing knowledge on performance feedback by showing the importance of a collaboration team approach that adhered to meeting guidelines. The data collected by Burns et al. consisted of a checklist outlining meeting steps completed by an independent observer during each team meeting’s discussion of an individual student. Significant improvement was documented from baseline (absence of performance feedback) through intervention stages (performance feedback provided by researcher on the importance of each meeting step).

Ihlo (2004) extended previous research in the area of performance feedback to support intervention adherence by teachers. In these earlier studies, the researchers assumed that the performance feedback meetings served as a reminder or motivator for the teacher to complete the intervention (Ihlo, 2004). However, other factors such as complexity of the intervention plan, perceived and actual effectiveness of the plan, teacher choice of intervention and collaboration during the development of the intervention plan all have been linked to intervention adherence (Ihlo, 2004; Gresham, 1989). In Ihlo’s 2004 study, she
used 5 teacher subjects. Each teacher subject was paired with a graduate student (1 doctoral student and 4 master-level students) in school psychology. Each consultant-teacher pair developed an intervention adherence plan that targeted a behavior concern of a student in the classroom. An intervention script was developed, and the teacher implemented the intervention as scripted. The consultant monitored intervention adherence. The consultant-teacher pair problem solved for adherence concerns through a systematic problem-solving plan. The two developed a hypothesis for why the intervention adherence percentages were low. Following this meeting, a new plan was designed to increase intervention adherence. All but one of the teachers showed an increase in intervention adherence after problem solving. Also notable, three of the teachers had adherence levels that were at or above 70%. This included a 93% increase in median intervention adherence from the intervention phase to the problem solving for adherence phase. All teachers found the use of a systematic problem-solving approach acceptable.

In summary, RtI is a service delivery model that provides evidence-based instruction to all students. For those children at risk for a learning disability, it provides varying tiers of instruction to meet the needs of the students. Through CBM and progress monitoring, educators monitor the students’ progress toward grade-level benchmarks. Treatment adherence is an important component of RtI because it ensures that the intervention is implemented with fidelity and accurate student outcomes are being obtained.

**Collaboration**

Collaboration is repeatedly identified as an important feature of an inclusionary framework that is seen in most schools today (Thousand & Villa, 1990). However, many school professionals have difficulty collaborating, and there is resistance to this teamwork approach (Katzenback & Smith, 1993).

Schools and those who work within their walls have a unique and challenging goal – to meet the education needs of all students. Professionals need to take active roles to contribute their knowledge and perspectives in new ways for each child’s needs. Each member who works with struggling learners has a key role to play. One goal of the RtI model will be to find new and collaborative procedures that will work in the best interest of the children.
The National Joint Committee on Learning Disabilities (2005) stated that the successful implementation of RtI requires extensive knowledge and skill on the part of the regular education teacher. However, two recent studies found that many teachers are often uncertain of what effective reading instruction is; the authors even found that many teachers use instructional methods that have no basis in research (Graney, 2008; Moats, 2007).

In the area of RtI, there have been more descriptive articles than experimental studies explaining the roles of School Psychologists, Teachers and Speech-Language Pathologists in the RtI process. However, the studies on performance feedback have shown positive growth in student performance when the regular education teachers and the psychologist form a collaborative problem-solving team. Consultation is defined as a service delivery model in which a consultant (e.g. behavior specialist) and a consultee (e.g. teacher, parent) work together to resolve a concern (Bergan & Kratochwill, 1990). This research has tended to focus on addressing behavior changes in the classroom.

Rosenfield (1987) described a model termed *Instructional Consultation* (IC) with the primary goals of improving, enhancing and increasing student growth through supporting teacher instruction. The goal of an Instructional Consultation team is to build a collaborative, problem-solving team within a school by providing a core of educators capable in the IC process (Rosenfield, & Gravois, 1996). Rosenfeld (1992) found that instructional consultation teams supported academic performance and behavioral achievement, reducing the over-identification of children in special education.

Korth, Sharp and Culatta (2010) examined SLPs collaborating with Head Start teachers in the implementation of an early literacy program. The SLPs instructed 4-year-old preschool children using an early reading program. The teachers stayed in the classrooms during the instruction, and the SLPs incorporated the teachers’ classroom themes into their instruction. Results demonstrated that teachers’ early understanding and practices were influenced by exposure to the early literacy instruction. These researchers felt that the success of their study was dependent upon collaboration and cooperation between the SLPs and teachers.
Prelock, Miller and Reed (1995) described a collaborative model they termed Language In the Classroom. Their model was based on a transdisciplinary approach where the SLP learned the content standards or curriculum of the classroom and the teacher learned how to facilitate communication in the classroom. The teacher and SLP developed a collaborative relationship to plan classroom communication interventions. They met once every three weeks to plan 30- to 40-minute intervention sessions. The teacher collected both narrative and “tally” data to track student outcomes post-intervention. The authors felt that the strength of their program was an overall commitment to a shared responsibility for student outcomes. They found that the advantages of implementing a collaborative model of intervention were many: relevancy to what the SLP is teaching the students; shared understanding by both the teacher and SLP of the child’s needs; awareness by the teacher of the importance of communication skills and how they impact learning; and, a more efficient method of service delivery to “at-risk” students.

Hadely, Simmerman, Long and Luna (2000) designed an experimental study that investigated a collaborative model in kindergarten and first-grade inner-city classrooms. The speech-language pathologist taught in two classrooms (two other classrooms served as control groups) 2 1/2 days per week. The teachers and SLP designed interventions targeting phonological awareness and vocabulary. Children in the experimental classrooms made more gains in receptive and expressive vocabulary development, beginning sound awareness and letter sound associations than did those in the control classrooms. They also showed gains in other phonological skills not directly instructed, which was an indicator of the generalization of taught skills.

Sickman (2007) investigated the collaborative relationship between the SLP and Head Start preschool teacher. The researcher examined the change in use of literacy enhancement activities by the teachers after these activities were modeled by the SLP. Four Head Start teachers served as subjects in this study. Four other Head Start teachers served as the control group. The control group received information on the types of literacy enhancement activities during an in-service presented by the researcher. In the experimental group, ten literacy enhancement activities (such as expansions, asking open-ended questions, asking a prediction question) were modeled by the SLP for ten consecutive weeks during
Sickman found that teachers’ use of literacy enhancement activities increased from baseline measurements, and the teachers continued to use the strategies as evidenced by follow-up videotaping. Data indicated that the teachers maintained the use of the strategies for one school year but maintained only two of the enrichment strategies into the beginning of the next school year. The researcher felt that teacher attrition, lack of regularly scheduled follow-up with the SLP and preparation time helped explain why some of the strategies were not used by the teachers into the next school year. There was not a significant difference for the teachers in the control group between baseline data and follow-up videotaping ten weeks post in-service. This study concluded that the modeling of behaviors during a collaborative procedure did change teacher behavior. In fact, results indicated that the collaboration can take place in the preschool classroom. The study also found that teachers’ implementation of strategies during book reading can be improved by just a short period of time (ten weeks). The researcher did conclude that scheduled follow-up meetings would support the maintenance of the strategies being implemented by the teacher for extended periods of time.

In a similar study, Combs (2009) looked at the changes in teachers’ use of language enhancement strategies following ongoing, in-class information sharing and modeling by an SLP during play in the dramatic play center. Five teachers served as the subjects, five as the control group. The control group was videotaped at baseline and at the end of the study during the follow-up stage. For the experimental group, the SLP explained the strategy and modeled one strategy (expansions, open-ended questions, vocabulary) each week for three consecutive weeks. Results indicated that the teachers used open-ended questions and expansions immediately after the modeling (on training day) but failed to use the strategies two weeks later. This implied that the teachers needed ongoing consultation for implementing the interventions.

In summary, collaboration between educators has improved the implementation of interventions. Even “good” teachers implementation of interventions improved when collaborating with others.

**Summary**
The ultimate goal of reading is comprehension. Thirty years of research has clearly defined the components required for good comprehension. This study honed in on four of those areas: vocabulary, syntax, inferencing/predicting and comprehension monitoring/asking questions. Research has established that there is a difference between how good comprehenders and poor comprehenders approach text.

What we know about reading comprehension interventions is that there are strategies teachers can use that have been proved to help students with reading comprehension difficulties. Most research in this area has been implemented outside of the regular classroom; this study, on the other hand, will be conducted in the regular classroom setting. This study will investigate whether teachers can provide reading comprehension interventions with fidelity and whether student outcomes will be affected.

We know that the Response to Intervention model presents a potential opportunity for educators to address the needs of children with learning difficulties. Researchers and other stakeholders are beginning to understand that RtI could have an important role in identifying children with reading disabilities. It also has the additional roles of not over-identifying children, supporting those who do not have a true disability and helping them succeed in the regular education classroom. However, there is not enough evidence for us to know just how effective RtI will be. Will it face the same fate as previous intervention models, initially touted for their effectiveness and employed to improve reading disabilities but later found to have flaws that limited their ability to make an impact? This study will establish additional evidence-based research on whether reading comprehension interventions can be effective at the Tier 2 level. To do so, it will specifically consider whether children’s reading comprehension scores improve through the application of a defined, systematic, collaborative, classroom-based intervention. Research has established the effectiveness of collaboration in schools. In addition, we know that providing teachers with feedback supports intervention fidelity. However, there is very little research on the collaboration model within the RtI framework. Most of the research done with SLPs has involved modeling practices or working alongside teachers in the classroom. In the RtI framework, teachers are expected to provide intervention to Tier 2 children in the classroom setting. In this study, a specific intervention targeting vocabulary, syntax, inferencing/predicting and comprehension monitoring/asking
questions will be implemented in the classroom. The SLP will collaborate with the teacher weekly, but ultimately the teacher is the one who will carry out the intervention. The goal of the study is to establish whether this approach is feasible and can impact student outcomes in the area of reading comprehension.

This study has three purposes. First, its goal is to determine whether a specific collaboration procedure will result in reading comprehension interventions being implemented in the classroom by the regular education teacher. Second, it will examine whether the regular education teacher’s attitude toward the collaboration procedure and intervention effectiveness impacts treatment adherence. Third, it will examine whether using a systematic intervention will impact children’s reading comprehension scores. The procedure entails the following: identification of a student with a reading comprehension-only deficit; teacher training of the intervention; implementation of the intervention; performance feedback meetings; administration of CBM-Maze and reading comprehension passages to monitor student progress; and collection of permanent products to ensure adherence. This research seeks to answer practical questions about how to best implement reading comprehension interventions in the classroom using the RtI paradigm.

I will employ three key questions to direct my research:

1) Does the use of performance feedback increase teacher adherence to collaboratively developed reading comprehension intervention?

2) Is the regular education teacher’s attitude toward the collaboration procedure and intervention effectiveness related to treatment adherence?

3) Will Tier 2 children’s reading comprehension scores improve (as defined by reading comprehension measures, CBM-Maze and grades) through the application of a defined, systematic, collaborative, classroom-based intervention?
Chapter III

METHODS

The purpose of this study was to determine whether a Tier 2 RtI intervention plan developed collaboratively by the teacher and SLP supported teacher adherence to reading comprehension interventions for at-risk students. Specifically, it examined the effects of performance feedback meetings on teacher adherence to the intervention. It further examined whether this procedure improved the reading comprehension scores of at-risk students. The final objective of this study was to determine if teachers’ attitudes toward the procedure affected teacher adherence. The collaborative procedure outlined steps to be followed by an SLP and teacher to provide reading comprehension interventions in the classroom. The initial step was training the teacher to use a reading comprehension intervention that targeted areas shown to support reading comprehension: vocabulary; comprehension monitoring/asking questions; making inferences/predicting; and understanding syntax (specifically clauses and conjunctions). The initial training (initial baseline period) varied across teachers depending upon the length of time it took to implement the intervention with 100% fidelity. This first baseline phase is labeled the teaching training phase. Once this occurred, the no support phase began. This phase documented teacher adherence to the intervention after training when no support was given. The feedback meeting phase began once the percentage of treatment adherence fell to 75% or demonstrated a downward trend for three sessions. During this phase the teacher was given an intervention outline which was a step-by-step procedure to be followed. It included the time needed, the material list and steps for the intervention. During the weekly feedback meetings, the SLP and teacher discussed the students’ progress and any concerns the teacher had about the intervention or its implementation in relationship to the students’ progress. The feedback meetings were focused in student progress rather than teacher implementation. Interventions were discussed in relationship to their impact on student progress. In addition to discussing student outcomes, planning occurred for the next week.
A multiple-baseline design across subjects was used to analyze the teacher’s adherence to the protocol during each session to determine the effect of performance feedback on teacher adherence (research question 1). To determine if teachers’ attitudes toward a collaboration procedure and intervention effectiveness impacted treatment adherence, a Spearman RHO correlation was conducted to determine the correlation between scores on the teacher attitude rating scale and her adherence to the intervention (research question 2). Two different analysis methods evaluated the effect the intervention had on students’ outcomes: single subject design (reading comprehension questions and CBM-Maze) and a paired t-test (student grades).

Research Site This research project took place in two inner-city Catholic schools in a midsize, Midwestern city. The demographics for each school are listed in Table 1.

Table 1 Demographics of students in two inner-city Catholic schools which served as research sites.

<table>
<thead>
<tr>
<th></th>
<th>School One</th>
<th>School Two</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Students K-8th grades</td>
<td>168</td>
<td>264</td>
</tr>
<tr>
<td>Percentage on Free or Reduced Lunch</td>
<td>79%</td>
<td>50%</td>
</tr>
<tr>
<td>Percentage of White Students</td>
<td>67.2%</td>
<td>81.8%</td>
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<tr>
<td>Percentage of African American Students</td>
<td>19.8%</td>
<td>5.30%</td>
</tr>
<tr>
<td>Percentage of Multi-Racial Students</td>
<td>7.3%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Percentage of Hispanic Students</td>
<td>4.1%</td>
<td>.75%</td>
</tr>
<tr>
<td>Percentage of Asian Students</td>
<td>.75%</td>
<td>.75%</td>
</tr>
<tr>
<td>Percentage of America Indian</td>
<td>1.2%</td>
<td>2.2%</td>
</tr>
</tbody>
</table>
Participants

Teacher Subjects

Second-, third-, fourth-, fifth- and sixth-grade certified teachers were eligible to participate in this study. Six elementary school teachers who taught grades one, two, three, four and six participated See Table 2 for the demographic information of the teacher subjects. Teacher subjects were asked to sign an informed consent agreeing that they would participate in the study and that data collected in their classroom would be used for the study.

Table 2 Teacher Demographics

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Grade Level</th>
<th>Number of Years Teaching</th>
<th>Number of Years at Current Grade Level</th>
<th>Number of Students in Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>11</td>
<td>10</td>
<td>3</td>
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<tr>
<td>6</td>
<td>3</td>
<td>11</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

Student Subjects

One to four students per classroom were selected to participate. The number of participating students per classroom was dependent upon how many students in the classroom demonstrated reading comprehension-only difficulties. In order to preserve the typical procedure of the school, all students in participating grades were given a Curriculum-Based Measurement (CBM) targeting reading
comprehension. Eligible students were selected on the basis of their results on the CBM-Maze. The Maze is a standardized assessment for evaluating reading comprehension performance with reliability and validity evidence supporting its use (Shinn & Shinn, 2002). Children who both scored below the 25th percentile on this measure and above the 35th percentile on the DIBELS oral-reading fluency probe were eligible to participate in the study. According to DIBELS, children who score above the 35% are at low risk for oral reading fluency disorders (DORF: Good & La’omslo, 2002) (Appendix A). On this task, the student’s score was based upon the number of words read correctly in one minute. The DIBELS oral reading fluency probe provides fall benchmark (as well as winter and spring) criteria for students. Students who fell below grade-level oral reading fluency benchmark norms were not eligible to participate. Parents were asked to give permission for their child’s data to be included in this study. Only eligible students with parent permission took part in the study.

Speech Language Pathologist Participant

As the primary researcher for this study, I served as the speech language pathologist. I work in both schools on a part-time basis.

Data Collectors

Two fourth-year speech language pathology undergraduate honor students observed intervention implementation and documented the accuracy of procedural steps during performance feedback meetings. During the teacher training phase, they were trained in observation procedures.

Each student was responsible for directly monitoring teacher implementation of the intervention a total of two times during the feedback meeting phase for each teacher. The observers used the intervention checklist to rate the teachers’ adherence to the intervention and implementation procedure. The SLP later compared the data collectors’ checklists with her own checklist completed from the collected permanent products to ensure reliability. The number of agreements between the SLP and observer for documentation of teacher adherence on the checklist was divided by the total number of items on the
checklist. There was 90% agreement across all of the SLP/observer pairs. During the eight weeks of performance feedback phase, the observers also attended one problem solving/performance feedback meeting between the teacher and SLP to observe adherence to meeting procedures. The observer used the Problem-Solving/Performance Feedback Checklist (Appendix B) to determine the components discussed during the meeting. Training for the observers is discussed in a later section.

Procedure

Step 1: Demographic Survey

All teachers completed a demographic survey identifying their age, gender, grade levels taught, current grade level teaching, years of teaching experience and years teaching current grade level. All teacher participants were asked to answer questions related to their experience and proficiency with using the RtI model (See Appendix C).

Step 2: Identification of At-Risk Students

During the first four weeks of school, all students in participating schools were assessed using the CBM-Maze. This procedure was part of the typical data collection method used for progress monitoring by the schools. Children whose scores fell below the 25th percentile were administered grade-level passages from the DIBELS oral reading fluency (DORF: Good & Kaminski, 2002). Only children from this group whose scores placed them above 35% were eligible. According to DIBELS, children who score above 35% are at low risk for oral reading fluency disorders. Interventions were developed for children who did not reach benchmark for oral reading fluency; however, since this study examined children with reading comprehension-only deficits data from their intervention were not used in this study. After benchmark data were collected, students who were at risk for reading comprehension difficulties void of fluency deficits were identified and enrolled in Tier 2 intervention.

Step 3: Teacher and SLP Initial Meeting

As is normal school procedure, the teacher and SLP met and reviewed reading comprehension work samples and CBM-Maze scores for children who were candidates for the study. Once the teacher and
SLP identified a child who was eligible to participate in the study, a permission slip was sent home to the parents. Only children whose parents returned the permission form participated in the study.

*Step 4: Intervention Development*

Once the permission form was returned, the teacher and SLP discussed the intervention steps and how the intervention would be implemented into the classroom ecology for the upcoming weeks. The intervention included evidence-based strategies to support reading comprehension in the areas of vocabulary (Hawkins et al., 2010; Nicholson & White); predicting (Richards & Anderson, 2003); comprehension monitoring (Chan & Cole, 1986) and syntax (Gillon & Dodd, 2010). The intervention checklist was used to systematically teach the intervention to the teacher. This first step of training was conducted outside of the regular classroom. The overall intervention framework was reviewed along with corresponding materials. The SLP and teacher discussed how the intervention would fit into her classroom, and the intervention was tweaked accordingly. In addition the intervention was adjusted to meet the specific needs of the teachers and students involved. This first meeting allowed for role playing, questions-and-answers, and adjustments to the intervention if needed.

*Step 5: In-the-Classroom Teacher Training*

The intervention consisted of six distinct steps, and the SLP was present to support the teachers’ implementation of the intervention during this phase. The SLP answered questions, provided prompts and reminders as needed and observed to make sure the intervention was implemented as scripted. The general steps of the intervention were:

1. The teacher introduced the topic for the day.

2. She explained to the students that it is important to think about the topic and make predictions or guess what they know about it. She explained that when people make inferences they are guessing based upon what they know or information they have already learned about the text.
3. She asked the students to write their predictions down in their notebook and read their predictions to the small group. After that, the teacher asked why they made that guess and shared with them her own prediction.

4. The teacher introduced the new vocabulary words. The students and teacher discussed what each vocabulary word meant and drew a picture representation of the definition.

5. The students and teacher read the section of text. After the first sentence or few sentences (depending upon the text), the teacher modeled a “think aloud”. This strategy was used to teach the students comprehension monitoring. The students and teacher continued practicing this strategy by writing what they were thinking after each sentence or few sentences.

6. Finally, the teacher pointed out clauses and conjunctions, defined the clause and helped the students determine what it modified.

The teachers were required to adhere to the intervention steps faithfully; the only exception was that they pulled back on their support as students made progress. Student progress was monitored relative to an aim line. The line was a trajectory plotting the student’s goal over a period of time. The ultimate goal was to reach the score that was grade-level benchmark for CBM-Maze. As the student made progress toward his goal, the teacher decreased support from intensive one-on-one to minimal prompts with visual support. As the student continued to progress, she provided visual supports only (Appendix D) with reminder prompts to use the visual aid. The intervention support was decreased if a student’s score on the CBM-Maze followed the aim line for two weeks. If this occurred, the SLP and teacher discussed the student’s progress and determined the next level of support (for example, either less frequency or visual supports only). The level of support varied for each student depending upon the student’s progress as tracked through progress monitoring.

The teacher was provided with the materials (as outlined below).
Materials

Each week, the teacher and SLP decided which academic content area best supported the intervention. All materials needed for the intervention were given to the teacher by the SLP. The intervention checklist was a step-by-step outline of the intervention (Appendix E). It employed evidence-based interventions targeting inferencing/predicting, vocabulary, comprehension monitoring/asking questions and syntax. The intervention checklist was also used by the independent observer when completing integrity checks. The intervention targeted all four of these areas. The checklist and all other teacher materials were placed in a teacher binder. The teacher was instructed to refer to the checklist during implementation if needed.

In order to monitor student progress as well as teacher adherence, each step of the intervention resulted in a permanent product of the child’s work or a step completed in the teacher binder (Table 3). The teacher was given binders to pass out to the students during the intervention. The binders kept all of the children’s permanent products and the grade-level reading passages with follow-up reading comprehension questions that the students completed. The teachers had the option to give tickets to the student for completion of an activity, to be accumulated for a reward. The teacher was provided with objects or activities that were used as rewards. Some teachers did not want a reward system in their classroom, so they did not hand out tickets after completion of any activity. They preferred to use a reinforcement system already established for their classroom.

Step 6 Classroom Teacher Training Phase

The first phase was teacher training. This phase taught the teacher the intervention and monitored her adherence to the intervention with support. In this phase, the teacher explained the intervention to the participating students in a small group. The SLP attended this meeting and prompted the teacher only if she omitted a step or defined a step incorrectly. Following the explanation, the SLP was present in the class while the teacher implemented the intervention. Once again, she prompted the teacher only if an intervention step was omitted or performed incorrectly. The SLP returned to the classroom during the implementation of the intervention until the teacher carried out the intervention with 100% fidelity.
Step 7: No Support Phase

Once the teacher implemented the intervention with 100% fidelity, the no support phase began. During this phase, withdrawal of support and its effect on treatment adherence was examined. The SLP explained to the teacher that she appeared to be managing the intervention effectively. The teacher was told that the SLP would not be returning to the classroom, but the teacher was asked to continue with the intervention and collect the data daily. She placed the completed permanent products and reading comprehension passages in the binder. The SLP picked up all forms from the binder two times a week. The SLP calculated the percentage of intervention steps completed and graphed the results. When a teacher’s intervention adherence percentage was low (as measured by permanent products turned into SLP) (75% or less) or demonstrated a downward trend for two dates, performance feedback meetings were held.

Step 8 Weekly Performance Feedback Meeting Phase

The final phase, performance feedback, introduced weekly performance feedback meetings. The impact the performance feedback meetings had on the target behavior, treatment adherence, was recorded for the 8 weeks of this phase. Permanent products were used to determine the number of steps of the intervention the teacher carried out. Using permanent products is a proven method that reduces reactivity to observational measurement (Noell et al., 1997; Foster & Cone, 1986). Implementation of the intervention required a maximum of 12 steps (11 steps if the teacher was not passing out reward slips). Each step resulted in a permanent product. If there was no permanent product, that step of the intervention did not occur. The steps and the corresponding permanent product are outlined in Table 2. From past studies, it is assumed that the number of steps might be affected by a range of factors such as early dismissal, school assemblies or non-compliance of the student (Noell et al., 1997). Treatment integrity was calculated as the number of steps completed (as measured by the number of permanent products) over the number of total steps multiplied by 100.
Table 3: Intervention Steps and Scored Permanent Products

<table>
<thead>
<tr>
<th>Intervention Step</th>
<th>Permanent Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand out student binders</td>
<td>Presence of completed student sheets in binders at the end of the day</td>
</tr>
<tr>
<td>Introduce the topic for the day. Ask students to write title on their student sheets in their binders.</td>
<td>Title written on sheets in students’ binders</td>
</tr>
<tr>
<td>Explain predictions to the students</td>
<td>Presence of students’ predictions on their sheets in student binders</td>
</tr>
<tr>
<td>Ask students to read their predictions and explain why they guessed that</td>
<td>Teacher comments on the prediction in the teacher binder</td>
</tr>
<tr>
<td>Explain the topic to the students</td>
<td>Check in appropriate box on sheets in teacher binder</td>
</tr>
<tr>
<td>Read vocabulary words</td>
<td>Check in appropriate box on sheets in teacher binder</td>
</tr>
<tr>
<td>Pre-teach vocabulary</td>
<td>Vocabulary sheets completed by students in students’ binders</td>
</tr>
<tr>
<td>Have students write the words and draw pictures defining the words</td>
<td>Vocabulary words written and pictures drawn on sheets in students’ binders</td>
</tr>
<tr>
<td>Have students practice “think aloud” after each sentence</td>
<td>Student completed “think aloud” sentences in the student binder</td>
</tr>
<tr>
<td>Practice analyzing sentences with clauses</td>
<td>Student completed syntax section in student’s binder</td>
</tr>
<tr>
<td>Give students reading comprehension passage</td>
<td>Presence of completed reading comprehension passage in teacher binder</td>
</tr>
<tr>
<td>Optional step: Give reward slips/tickets</td>
<td>Reinforcer exchange noted on the slips in teacher binder</td>
</tr>
</tbody>
</table>

(*adapted from Noell, Witt, Gilbertson, Rainier & Freeland, 1997)

Once treatment adherence fell to the pre-determined criteria (i.e., 75% or a downward trend for 2 dates) the performance feedback meeting phase of the study began. This phase introduced weekly performance feedback meetings. The length of each meeting depended on the teacher. During the
weekly meetings, intervention results with performance feedback were reviewed, student outcomes were discussed, planning for the next week occurred and problems were addressed. All data were presented to the teacher on a graph. The teacher and SLP discussed the importance of treatment steps omitted by the teacher (Noell et al., 1997) and how the omission negatively impacted the intervention. Students’ weekly CBM-Maze scores were discussed as well as the percent correct on the reading comprehension passages. At this time, the level of support and changes to the intervention were discussed. The meeting concluded by discussing the next week’s plan.

*Step 9: Completion of Surveys*

At the end of the performance feedback phase, the teachers were asked to complete a Likert Scale survey regarding their attitudes about the collaborative procedure and intervention effectiveness. The survey targeted areas such as acceptability of the intervention, effectiveness of the intervention, effectiveness of the performance feedback meetings and overall satisfaction with the procedure (Appendix F).

*Data Collection*

*Question 1: Does the Use of Performance Feedback Increase Teacher Adherence to Collaboratively Developed Reading Comprehension Interventions?*

Several teacher training sessions were observed to determine the teacher’s adherence to the designed intervention before performance feedback meetings were initiated. During the first phase, teacher training, the SLP began collecting baseline data on all six teachers simultaneously; however, this phase varied in duration across teachers as part of the multiple baseline design. Data were collected daily, and the first teacher to achieve 100% treatment adherence moved to the no support phase (she was then referred to as teacher 1). Subsequently, teacher support was withdrawn one at a time at two-day intervals (now referred to as teachers 2, 3 and so on). Once the teachers moved into the no support phase, the second set of data were collected. During this phase, the teachers received no support from the SLP.
Data were collected through the use of permanent products and graphed by the SLP. Scores graphed were compared to the scores from the teacher training phase to determine if the withdrawal of support had an impact on teacher adherence. Once the first teacher’s performance fell to 75% accuracy or had two consecutive dates of a downward trend, the performance feedback phase was initiated for this first teacher. The SLP continued collecting data for the remaining teachers. The performance meeting phase was introduced to one teacher at a time in two-day intervals. Only the first teacher had to fall to criterion, and the other five teachers were phased up regardless; this is an acceptable multiple baseline procedure (Richards, Taylor, Ramasamy & Richards, 1999). Otherwise, some teachers’ adherence may never have fallen to criterion and the teachers may have never proceeded to the next phase.

The performance meeting phase started after the no support phase. Once treatment adherence fell below 75% accuracy or demonstrated a downward trend for two consecutive days for the first teacher, this phase began with weekly performance feedback meetings of 10-30 minutes. The teacher’s adherence to the intervention was graphed as in the other two phases. Scores during this phase were compared to scores from the no support phase in order to determine if the addition of the performance feedback meetings impacted teacher adherence. During performance feedback meetings, teacher and SLP discussed how implementation was going and reviewed any omitted steps and the impact omissions had on intervention success. The SLP shared with the teacher the completed intervention steps and student’s score on the CBM-Maze and percent correct on reading comprehension passages. Student outcomes were discussed in order to make adjustments to the intervention and to monitor the student’s progress. At the conclusion of each meeting, the upcoming week’s lesson was discussed. The teacher decided what content area was best suited for the intervention. Each teacher participated in eight weeks of this phase.

Data Collection and Coding of Permanent Products.

The presence or absence of permanent products was recorded on the intervention data collection form to indicate whether it occurred (+) or did not occur (0). A code of n/a (not applicable) was given if the teacher did not have the opportunity to complete an intervention step because of a conflict in the school
schedule, such as an assembly or early dismissal (Appendix G). The teacher was not held accountable for the intervention for that day if implementation was interrupted. All permanent products were collected during the weekly meetings and scored by the SLP. Student percent correct on reading comprehension passages was calculated and graphed on the chart. During these weekly meetings, the Performance Feedback/Procedural Checklist was used to document that all meeting steps were carried out. Adherence was calculated as a percentage, using the number of steps of the meeting completed divided by the total number of steps minus those that were not applicable and multiplied by 100.

**Question 2: Does the regular-education teacher’s attitude toward the collaboration procedure and intervention effectiveness impact treatment adherence?**

Data to answer this research question were collected using a teacher survey (Appendix F). Based upon a data analysis method used in a previous study by Musti-Rao, Hawkins and Barkley (2009), a Likert scale was completed by the teachers after the study. The survey targeted areas such as intervention acceptability, intervention effectiveness and procedure effectiveness. The teachers answered questions on these topics using a scoring range from 1 to 5. In essence, this scale measured the buy-in of the teachers and was used to determine how teacher attitude affected treatment adherence.

**Question 3: Will reading comprehension scores improve through the application of a defined, systematic, collaborative, classroom-based intervention?**

Once parent permission forms were returned, students’ reading comprehension baseline data were collected and graphed for three areas: CBM-Maze scores, students’ reading comprehension scores on grade-level reading passages, and students’ grades. The students’ CBM-Maze baseline consisted of two graphed data points, including their scores on the CBM-Maze routinely administered to all students at the beginning of the year. CBM-Maze baseline data points were obtained before the teacher training phase. The reading comprehension baseline was determined by student scores on four grade-level reading comprehension passages administered before the teacher training phase. For the final baseline, chapter
test grades from core curriculum classes were taken from the teacher grade book. The classes included social studies, science, reading and religion but varied according to grade-level. The grades covered the period prior to the initiation of the teacher training phase. Collection of baseline data began simultaneously for all students.

During the teacher-training phase, no support phase and the performance feedback phase the student outcomes were collected by:

- **CBM Reading Maze:** The Maze is a standardized assessment for evaluating reading performance with reliability and validity supporting its use (Shinn & Shinn, 2002). Passages for this procedure are derived from narrative fiction written and tested with students to ensure that those used within each grade level are comparable in complexity. It is a multiple-choice cloze task that the students complete during silent reading. After the first sentence of a 150- to 400-word passage, every seventh word is replaced with three words inside of parentheses: the word from the original passages plus two distracters. The distracters are not random but similar to the real word. One of the words is the same “type” (noun, verb, adjective) but cannot make sense or maintain meaning. The second distracter is not of the same type but is a word selected randomly from the story. It, too, does not preserve meaning or make sense. The Maze procedure is a commonly used tool to screen and identify children at risk for reading comprehension difficulties, to monitor progress and improvement of individual children throughout the school year and to make program evaluation decisions and improve accountability. For the eight weeks of the performance feedback phase, the teacher administered the CBM-Maze weekly. The SLP scored and graphed the results.

Administration of the Maze followed guidelines outlined in the *AIMSweb Training Workbook: Administration and Scoring of Reading Maze for Use in General Outcome Measurement* (Shinn & Shinn, 2002). The authors recommend that examiners are consistent in administration and scoring. They recommend “check outs” using the accuracy of implementation rating scale (AIRS) in order to ensure consistency in administration from class to class and student to student (Appendix H). This scale was used by the teacher during the administration of the CBM-Maze.
• **Reading Comprehension Passage:** The teacher passed out reading comprehension passages taken from a teacher resource site which provided readability checks. These passages were primarily narratives, but there were some expository pieces. It could be hypothesized that the results were impacted by students’ level of interest in the content; however one strength of a multiple baseline design is that it accommodates an outlier in a way that does not compromise all of the results. This helped control for a possible low score on a passage that did not interest a student. The teacher was encouraged to have the children complete one passage after the completion of each intervention, as well as other passages during down time in the classroom. On an average, the students completed one per week. During the weekly feedback meetings, the teachers expressed that they were having difficulty administering the passages more often because of time constraints. They were encouraged to have the students complete at least three a week so sufficient data could be collected. The student was given a grade-level reading passage followed by eight reading comprehension questions. Reading comprehension worksheets completed during down time were considered the bonus worksheets. Student’s reading comprehension performance was scored as the percentage of items answered correctly by each student on these reading passages. Scoring of student responses to the reading comprehension questions was completed by the SLP. Data for the three phases consisted of scores obtained from reading comprehension questions completed and from any bonus worksheets the student completed. The SLP collected these graded passages two times per week in order to discuss student progress during procedural feedback meetings.

• **Student Grades:** The final outcome measured was the students’ grades on chapter tests. The SLP compared mean baseline grades for each student with the mean of grades recorded for four weeks after implementation of the intervention. The students’ scores were compared to their own scores, not across classrooms or other students. The grades were taken from core curriculum classes such as Science, Social Studies, Reading and Religion. The classes varied per grade-level. Teachers record grades in their grade books as percentages.

*Training for Student Participants*
The first step of training for the observers occurred before initiation of the study. They were trained on using the intervention adherence checklist and were given observation codes. Scenarios were used so the observers could practice using the codes. Scenarios were practiced until the graduate observer coded each scenario with 100% accuracy. The observers had time to ask questions about their responsibilities and how to carry them out.

The observer monitored with the SLP to determine the reliability of the observer’s scoring. The observers watched in one of the classrooms where the teacher was implementing the intervention during the teacher training period. The observer and SLP had a hard copy of the intervention outline and coded each step of the intervention using the coding system. Agreement between the two observers was calculated by dividing the number of agreements by the number of coded steps (agreements plus non-agreements) and then multiplying this number by 100. Past research studies have used this protocol requiring observers to reach 80 percent reliability before collecting data for a study. Once this occurred, the SLP and student observed together at least one more time. Once again, agreement between the two observers was calculated by dividing the number of agreements by the number of coded steps (agreements plus non-agreements) and then multiplying this number by 100. The criterion of 80% accuracy between the two observers was used. After the observer was trained, she independently observed and scored two more intervention sessions conducted by the classroom teacher during the performance feedback phase.

**Experimental Design**

A multiple baseline across subjects design was used to determine the effect of performance feedback meetings on teacher adherence. In a multiple baseline design, repeated measures of baselines are taken concurrently on two or more baselines (Richards, Taylor, Ramasamy & Richards, 1999). When a steady, predictable baseline is obtained, the independent variable (performance feedback meeting) is implemented. The effect of the independent variable on the dependent variable is recorded over time. This study measured the effect of performance feedback meetings on treatment adherence in comparison
to treatment adherence without support. This design was also used to evaluate the effect of a reading comprehension intervention on the percentage of reading comprehension questions answered correctly. The student subjects’ CBM maze performance and reading comprehension scores were plotted weekly during the teachers’ three phases (teacher training, no support and performance feedback). The aim line was determined by drawing a diagonal line from the mean of the baseline scores to benchmark. The students’ progress was analyzed by observing the number of data points that followed the aim line. The scores were then analyzed to determine how the level of teacher adherence impacted the students’ scores during the three phases. There are several advantages to using single subject design in behavioral sciences (Baer, Wolf, & Risley, 1968; Richards, Taylor, Ramasamy & Richards, 1999): (1) it does not require withdrawal of treatment to demonstrate the relationship between the independent and dependent variables; (2) it can be used for more than one subject needing the same general type of intervention; (3) it is good for those cases where the independent variable should not be withdrawn or the achieved target behavior cannot be reversed ; (4) and, the sequential implementation of the independent variable mirrors the practice of many teachers.

The final student outcome measure, grades, was analyzed using the t-test for related samples. The students’ baseline grades (taken before start of teacher phases) were compared to their grades four weeks after the performance feedback phase. Analysis was completed to determine if the intervention had a significant effect on students’ grades.

To determine if teacher attitude affected treatment adherence, the data were analyzed using the Spearman correlation, which measures the degree to which a relationship between two variables exists (Gravetter & Wallnau, 2007). Spearman correlation is used when both variables are measured on an ordinal scale. In this study, it was used to determine if there was a relationship between the teachers’ attitudes toward the intervention procedure as measured by their overall ratings on the Likert Scale and their adherence to the intervention.

Measurement of treatment adherence was conducted by review of permanent products. Several past research studies have used permanent products as the primary dependent variable (Noell et al., 2005).
The extent to which teachers implemented the students’ intervention plans as they were designed was measured by the permanent product. In this study, the reading comprehension intervention is designed to have a permanent product completed by the student or teacher (Appendix I).

Several methods were used to quantify the extent to which changes in behavior were reliable (Gresham, 2005). Below is a description of the methods that were used in this study.

**Visual Analysis of Grapped Data**

Generally, visual analysis of data is used when continuous numerical data are gathered. The data graph allows formative and summative analysis of study outcomes to be made (Richards, Taylor, Ramasamy & Richards, 1999). Visual inspection of the graphed data from baseline levels of performance to post-intervention levels of performance is completed. If an effect was produced by treatment, it should be observable by viewing the graphed data (Morgan & Morgan, 2001). Two aspects of the data are examined: level (performance on the dependent variable) and trend (changes or consistency in the data path) (Tawney and Gast, 1984). Level and trend are examined both within and between phases of the study (within and between baseline and intervention phases) (Tawney and Gast, 1984). When inspecting changes between phases or conditions, visual analysis involves examining the number of data points, the variability of performance, the level of behavior, and the direction and degree of any trends (Cooper et al., 1987).

Changes in level of behavior and trend of data collected from the teacher training to no support to performance feedback phases were examined for both effect of performance feedback meetings on treatment adherence and effect of reading comprehension interventions on reading comprehension questions and maze performance.

**Percent Change**

Percent change calculates behavior change from baseline to post-intervention levels of performance (Gresham, 2005). The mean level of performance during baseline is compared to the mean level of performance in intervention phase (performance feedback). Percent change compared the mean student
baseline data of student outcome measures to the mean data taken after the performance feedback phase. The mean of all data points taken during the student baseline phase was compared to the mean of all data points taken during the performance feedback phase. According to Gresham (2005), the advantage of the percent change is that outliers do not affect the results like other metric computations such as the percent of non-overlapping data points.

Percent change was calculated for the effect of reading comprehension intervention on the percentage of reading comprehension questions answered correctly by the students. The formula for percent change was $M_B - M_I / M_B$. In this formula, $M_B$ represents the mean baseline score and $M_I$ represents the mean intervention score.

**Percent of Non-Overlapping Data (PND)**

Percent of non-overlapping data is the most frequently applied procedure for quantifying treatment effectiveness in single-case studies (Schlosser, Lee & Wendt, 2008). PND is a useful index because it: (1) performs well in a short data series, producing low estimates in absence of a treatment effect and higher ones in its presence; (2) is easy to interpret in applied rather than in statistical terms; (3) is simple to compute; (4) is easily complemented by visual inspection (Manolov & Solanas, 2009). To compute PND, the formula is the number of intervention data points above the highest baseline (or previous phase) point divided by the total number of intervention points and multiplied by 100. In this study, PND was used to determine the effect performance feedback meetings had on teacher adherence as well as, the effect the intervention had on student grades taken from the teachers’ grade books.

**Teacher Attitude**

The Spearman correlation was used to whether there was a relationship between teachers’ attitudes toward the procedure and the degree to which they implemented the intervention with fidelity. The Spearman correlation measures the degree to which a relationship between two variables exists (Gravetter & Wallnau, 2007). The teacher survey targeted areas such as intervention acceptability, intervention effectiveness and procedure effectiveness. The teachers answered questions on these topics using a
scoring range from 1 to 5. The attitude scores were rank-ordered and compared to the rank-ordered percentage of teacher adherence scores from lowest to highest. These two scores were then correlated
Chapter IV

Results

Three research questions drove this study. The results for the questions are reported separately. For the first question, *(Does the use of performance feedback increase teacher adherence to collaboratively developed reading comprehension intervention?)*, a multiple baseline across subjects design was used. Two analysis methods were used to interpret the graphs: visual analysis of graphed data and percent of non-overlapping data (PND). The graph included three phases; teacher training phase, no support phase, and performance feedback meeting phase. During the teacher training phase, the teachers were trained on the intervention, and the SLP remained in the classroom until the teacher reached 100% of treatment adherence. The teachers were moved into the next phase one at a time in two-day increments after the first teacher reached 100% treatment adherence. Each teacher then moved into the no support phase in two-day increments one after the other; however, each teacher did reach 100% accuracy in the teacher training phase. During the no support phase, the teacher implemented the intervention without the help of the SLP. During the final phase, performance feedback meetings, the teacher implemented the intervention and met with the SLP weekly to discuss the intervention, ask questions, modify the intervention, plan for the next week and discuss student outcomes. Permanent products were completed by the teacher and students during all three phases and collected by the SLP. Results of each teacher’s percentage of adherence to the intervention during the three phases are described in order beginning with teacher 1. Results are reported across all teachers first and followed by an analysis of each teacher’s individual performance.

For the second question, *(Is the regular education teacher’s attitude toward the collaboration procedure and intervention effectiveness related to treatment adherence?)*, results from a teacher-completed Likert-scale survey were analyzed using the Spearman’s Coefficient of Rho Correlation.

For the third question, *(Will Tier 2 children’s reading comprehension scores improve (as defined by reading comprehension measures, CBM-Maze and grades) through the application of a*
Research Question 1: Does the Use of Performance Feedback Increase Teacher Adherence to Collaboratively Developed Reading Comprehension Interventions?

For the first question, visual analysis of data was used to interpret whether performance feedback increased teachers’ adherence to collaboratively developed reading comprehension interventions. Six teachers met the subject requirements. Each teacher had at least one student in her classroom who was identified as being at risk for reading comprehension difficulties based on scores on the CBM-Maze but whose oral reading fluency was above 35% on DIBELS.

Across all teacher participants. Teachers’ intervention adherence was graphed (Figure 1). For each teacher, adherence results were first analyzed by looking at trend, level of adherence and variability within phases. The results were then analyzed by looking at trend, level of adherence and variability between phases. For this portion of the study, there were three phases: Teacher Training, No Support and
Performance Feedback Meeting. Figure 1 displays graphs of percentages for teacher intervention adherence for all six teachers.

Visual analysis of the graphs of percentage of teacher adherence was performed by analyzing the level of adherence, trend and variability of the data. To indicate the median adherence within each phase, a virtual horizontal line was envisioned at the point on the vertical axis equaling the median value (Cooper, Heron, & Howard, 1987). If 80% to 90% of the data points within a phase fell within the 15% range of the median adherence, the level of adherence was considered stable (Ihlo, 2004; Tawney & Gast, 1984). Trend lines were also determined for each phase as outlined by Tukey (1977). Tukey recommended dividing the scores in a phase into three groups as evenly as possible. Two vertical lines were envisioned between the groups. In the first and third groups, the median data point was ascertained. A line was conceptualized that connected the two median points. This became the trend line. Trend lines were considered stable if 80% to 90% of data points in a phase fell within a 15% range of the trend line in that phase (Ihlo, 2004; Tawney & Gast, 1984). As is customary, the trend line was calculated during the analysis of the results but was not physically depicted on the teacher graphs.

Across all teachers, the median adherence percentage during the teacher training phase was 100% with a range of 63% to 100%. The median of all teachers’ adherence percentages during the no support phase was 75% with a range of 54% to 100%. Tawny and Gast (1984) recommend using the median value instead of the mean value when using visual analysis, especially when there might be variability in the data. The median percentage of teachers’ adherence during the performance feedback phase was 100% with a range of 54% to 100%. For the teacher training phase, each teacher reached 100% accuracy at adherence fell at least one time to 75% or below. Teacher 4’s performance never fell below 90% before she was moved into the performance feedback phase.
Figure 1: Percentage of treatment adherence for all 6 teachers.
To support the visual analysis of the graphs, percentage of non-overlapping data points (PND) was used to determine effect size. PND was used to determine the effect the independent variable had on the dependent variable. Table 4 list the effect sizes for each teacher and student.

Table 4: Distribution of teacher and student effect size

<table>
<thead>
<tr>
<th>Effect Size</th>
<th>Percentage</th>
<th>Number of Teachers</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(effect performance feedback meetings had on adherence)</td>
<td>(effect intervention had on comprehension questions answered correctly)</td>
</tr>
<tr>
<td>Highly Effective</td>
<td>90% +</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Moderately Effective</td>
<td>70%-90%</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Minimally Effective</td>
<td>50%-70%</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Ineffective</td>
<td>&lt; 50%</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Teacher 1 (Figure 2): Teacher 1 was the first to reach 100% accuracy in completing the intervention steps during the teacher training phase. She reached the no support phase after three days. Each teacher then moved into the no support phase in two-day increments one after the other and each teacher did reach 100% accuracy in the teacher training phase. Teacher 1’s behavior during the teacher training phase indicated an increasing trend over three data points moving from 82% to 100%. With support in the classroom, she learned the steps of the intervention and carried them out with 100% accuracy. Her data points remained stable at 70% in the no support phase. The teacher’s adherence to the intervention plan fell to 70% in the no support phase with the withdrawal of support. In the next phase, with the addition of performance feedback meetings, her adherence increased to 100% and remained fairly stable. Six of the eight data points were at 100% accuracy, while the other two were at 91% accuracy. There was
little variability of data points within each of the three phases. When considering changes in adherence between phases, there were immediate changes on the dependent variable (percent of adherence) when there was a phase change. To support the visual analysis of the graph, the percentage of non-overlapping data was calculated. Between the no support phase and the performance feedback phase, 100% of the data points did not overlap, indicating that performance feedback meetings were highly effective on teacher 1’s adherence to the intervention.

Figure 2: Teacher 1’s percent of adherence to the intervention for teacher training, no support and performance feedback phases

Teacher 2 (Figure 3): Teacher 2 also had an increasing trend during the teacher training phase from 63% to 100% over five sessions. In the no support phase, data points were stable with little variability from 63% to 70%. This was a decrease in percentage correct from the teacher training phase (100%) to the no support phase. The adherence remained stable. During the performance feedback phase, there was an increase in adherence with a range from 60% accuracy to 100% accuracy. Since 80% of the data points
fell within 15% of the mean level line, it was determined that the data remained stable and the mean level of performance line (adherence) was acceptable. Between phases, there was an immediate decrease in adherence between the teacher training and the no support from 100% to 63%. This indicates that the withdrawal of support had a significant impact on the level of adherence. However, introduction of the weekly meetings did not lead to an immediate increase in adherence. Adherence increased between weeks 3 and 4 of the performance feedback intervention phase (70%-81%). After week 4, data points returned to 100% with no variability. When calculating the percent of non-overlapping data, 63% of the data points did not overlap. This indicates that the performance feedback meetings had a minimal effect on the teacher’s adherence to the intervention. Although teacher 2 did not show a change in level of adherence between the no support and the performance feedback phases, which is a determinant of effectiveness, after the fourth week she consistently implemented the intervention with 100% accuracy.

Figure 3: Teacher 2’s percent of adherence to the intervention for teacher training, no support and performance feedback phases

Teacher 3 (Figure 4). During the teacher training phase, teacher 3’s performance showed a stable, gradual increase in adherence over seven data points from 91% to 100%. The level of adherence
remained stable in the teacher training phase with little variability in the data path. During the no support phase, there was a downward trend. There was an immediate decrease from the first to second data points from 100% to 75%. This was followed by a nearly stable trend over the next two data points, which were 75% and 70%. In this phase, 80% of the data points fell within 15% of the mean level of adherence line indicating the data remained stable and the mean level line was acceptable. There was an increase in adherence during the performance feedback phase from data points 1 and 2 (70% to 100%). Data points 2 through 8 remained stable at 100% accuracy representing a flat trend. There was little variability in performance within each phase indicating a steady data path with a clear trend. However, between phases there was a significant decrease in adherence after the first data point in the no support phase (100% to 70%) and a significant increase in adherence after the first data point in the performance feedback phase (70% to 100%). Although the percentage of non-overlapping data (PND) between the no support and the performance feedback meeting phases is 0%, and PND is significant in determining effect size, there are some additional noteworthy observations from the data path. While teacher 3 registered no adherence change between the teacher training and the no support phases, her adherence dropped off significantly for the remainder of no support, which could indicate that there is a residual effect on the teacher’s performance from the previous stage that dissipates after the first week. Likewise, teacher 3 registered no adherence change between the no support and the performance feedback phases but had a significant increase in adherence at the second data point in the performance feedback phase which she maintained. Again, this could indicate a residual effect on performance from the previous phase. However, since the PND was 0% the criteria indicate that the performance feedback meetings were ineffective for this teacher’s adherence.
Teacher 4 (Figure 5). During the teacher training phase, the data points were not stable. Only 77% of the data points fell within a 15% range of the trend line. There was variability in the data points with a range from 70% to 100%. In the teacher training phase, only 55% of the data points fell within 15% of the mean level line. Thus, it was determined that the level of adherence was not stable. In the no support phase, there was a downward trend with two data points at 100% and the final one at 90%. In the performance feedback phase, there was a flat trend in teacher 4’s performance. She achieved 100% accuracy throughout this phase. Analyzing teacher 4’s performance between phases reveals a stable level of adherence with no variability in data points between the teacher training and the no support phases. Between the no support and the performance feedback phases, there is an increase in adherence from 90% to 100%. The percent of non-overlapping data is 0% between the no support phase and the performance feedback phase, which indicates that the performance feedback meetings were ineffective to teacher 4’s adherence to the intervention. Teacher 4 had perfect treatment adherence during the performance feedback phase; however, it cannot be stated conclusively that performance feedback meetings were responsible because her performance was strong throughout all phases.
There was a stable increasing trend (70% to 100%) in the teacher training phase for this teacher. The level of adherence remained stable in this phase. Although there was an increase from data points 1 and 11, the majority of the data points were at 100% accuracy (8 out of 11). There is, however, one noted exception when data point 5 fell to 80%. During the no support phase, there was a flat trend. After withdrawal of the SLP support, the teacher’s percentage of adherence fell to 54% accuracy and did not change until performance feedback phase. During this phase, there was an increase in percentage correct from 54% to 100% but there was not a stable increasing trend. Only 75% of the data points fell within 15% of the trend line. During this phase, there was a stable flat trend from weeks 4 through 8, where the teacher reached and maintained 100% accuracy in implementing the intervention. There was not a stable level of adherence in the performance feedback phase. Only 63% of the data points fell within 15% of the mean level line. When analyzing the data points between the teacher training phase and the no support phase, there was a significant, immediate change in adherence from
100% to 54% indicating that the withdrawal of SLP support had an effect on teacher 5’s adherence and implementation of the intervention. Once the performance feedback phase was introduced in phase 3, there was a gradual increase in adherence; however, that increase was not significant until week 4. Calculating percent of non-overlapping data points revealed that 88% of the data points did not overlap. This indicates that performance feedback meetings were moderately effective in supporting the teacher’s adherence to the intervention.

Figure 6: Teacher 5’s percent of adherence to the intervention for teacher training, no support and performance feedback phases

Teacher 6 (Figure 7). Data points for teacher 6 showed little variability between phases. Nineteen out of 26 data points remained at 100%. In the teacher training phase, there was a stable flat trend with a range from 70% to 100%. For the no support phase, there was a stable decreasing trend. In this phase, the trend remained stable for three data points but had significant downward trend after that from 100% to 75% to 83%. In the final phase (performance feedback), there was a stable trend with only one data point not reaching 100%. In all three phases the level of adherence remained stable. There was not a significant adherence change between the teacher training and the no support phases. The data path
remained at 100% between phases until the fourth data point in the no support phase, where it fell to 75%. There was an immediate increase in adherence between the no support and the performance feedback phases indicating that the introduction of performance feedback had a positive effect on the dependent variable. The adherence change indicated that performance feedback meetings supported the teacher’s adherence to the intervention, which again rose to 100%. However, the 0% PND (ineffective) indicated that the performance feedback meetings cannot conclusively be credited for the high performance in that phase.

Figure 7: Teacher 6’s percent of adherence to the intervention for teacher training, no support and performance feedback phases
**Question 2:** Does teacher’s attitude toward the collaboration procedure and intervention effectiveness impact treatment adherence?

To answer this question, the Spearman’s Coefficient of Rank Correlation was utilized. The teachers’ adherence to the intervention and their attitude scores were ranked from smallest to largest. The Spearman correlation computed for these data revealed a correlation of .759. With n=6 and a significance level of .05, the observed correlation did not surpass the critical value (.886). The correlation between teachers’ adherence to the intervention and their attitude toward the collaborative procedure was not statistically significant.

**Question 3:** Will reading comprehension scores improve through the application of a defined, systematic, collaborative, classroom-based intervention?

*Across Students:* For the third question, visual analysis of graphed data was also used to determine if an at-risk student’s reading comprehension scores improved through the application of a defined, systematic, collaborative, classroom-based intervention (Figure 8).
Figure 8: Comparison of teacher adherence and students’ percentage correct on reading comprehension questions per classroom.
Three types of scores were obtained throughout the study: CBM-Maze scores, percentage correct on reading comprehension questions, and chapter test grades from core curriculum classes. The subjects included social studies, science, reading and religion but varied according to grade level. The mean of all grades for each student was determined and compared pre- to post-intervention. Visual analysis of graphed data was conducted in the same way it was for question 1. Trend, level of behavior (percent correct) and variability of data points were analyzed both within and between phases. Each score was graphed separately for each student. In addition to individual scores, graphs were also broken down by classroom, illustrating each measurement separately for all students in that classroom. Scores were divided into four phases: student baseline phase, teacher training phase, no support phase and performance feedback meeting phase. The last three phases corresponded to the teachers’ phases. The first phase (student baseline) was obtained prior to the initiation of the study. Baseline reading comprehension scores were taken from four grade-level reading passages administered before the initiation of the teacher phases. Baseline scores were also obtained for the other two student-outcome measures. The first CBM-Maze score was the one obtained as part of the school’s progress-monitoring system for all students. The second CBM-Maze score was obtained five to seven days later. Student grades used for the baseline were from the four weeks prior to the initiation of the teacher phases.

To support visual analysis of graphed data, two other analyses were conducted: Percent of non-overlapping data (PND) and percent change. Percent change was used to understand if there was progress made over time. PND was used to determine the effect size (Table 3).

**Reading Comprehension Questions**

*Classroom Teacher 1.* Three students in teacher 1’s classroom qualified for the study (students 1, 2, 3). All of the students’ qualifying scores are listed in Table 5
Table 5: Students qualifying scores for the DIBELS ORF and CBM-Maze

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<th>Student Subject Number</th>
<th>DIBELS ORF Score</th>
<th>CBM-Maze Score</th>
<th>DIBELS ORF Benchmark</th>
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Student 1 (Figure 9): During the baseline phase, student 1 had a mean percentage score of 46.8% with a range from 37% to 50% on reading comprehension questions answered. There was an immediate change in the percent correct from the first to the second data point (37% to 50%) where the percent correct remained stable for three data points. The trend line was not stable because 80% of the data points did not fall within 15% of the line. However, there were only four data points in this phase. During the teacher training phase, there was an immediate change in percent correct from 75% to 100%. The trend line was increasing, but once again there were a small number of data points (two). In the no support phase the percent correct was stable and the trend line was flat due to no variability in the data points. All three points were at 100%. In the performance feedback phase, there was variability in the data points. The mean percentage was 87.6% with a range from 50% to 100%. The median score was 88%. The trend line was not stable because only 33% of the data points fell within 15% of the line. Looking at the data points between phases, there was an immediate increase in percent correct between the student baseline phase and the teacher training phase (50% to 75%). There was no change in percent correct across the student baseline phase and the no support phase (remained at 100%) and then there was an immediate decreasing change in percent correct (100% to 88%) between the no support and the performance feedback phases.

The percent of non-overlapping data between the student baseline and the performance feedback phases was 100% indicating that the intervention had a significant impact on student 1’s ability to answer reading comprehension questions correctly. There was an 87.5% increase between the mean baseline score and mean intervention score.
Student 2 (Figure 10): The mean reading comprehension question score on student 2’s baseline phase was 47% with a range from 37% to 62%. The data path demonstrated a decreasing stable trend but there were only three data points taken. There was an immediate decrease in percent correct from 62% to 42%. While the other students had four data points each in the student baseline phase, subject 2’s absence resulted in the collection of only 3 data points. In the teacher training phase, there was an increasing trend and level of percent correct. There were only two data points taken during the teacher training phase (70% to 88%). During the no support phase, the teacher did not collect any reading comprehension passages from student 2, so there is not a data path in this phase. When performance feedback meetings were initiated, there is variability between the data points. The mean percentage is 87.6% with a range from 50% to 100%. The trend line is not stable because only 50% of the data points are within 15% of the trend line. The percent correct immediately decreases from 100% to 50% but then immediately increases to 88%, which continues on to 100%. Analyzing the result between phases, there is an immediate increase in percent correct between the student baseline and the teacher training phases from 37% to 70%. Since there are no data points in the no support phase for this subject, the teacher training
phase and the performance feedback phase were compared. There is an immediate percent correct change between these two phases from 88% to 100%.

The percent of non-overlapping data points between the student baseline phase and the performance feedback phase is 83% indicating that the intervention was moderately effective in improving student 2’s scores on reading comprehension questions. There was an 86.5% increase between the mean student scores at baseline and the mean scores during performance feedback.

Figure 10: Student 2’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Student 3 (Figure 11): The mean percentage of reading comprehension answered correctly for the student baseline phase was 54.5% with a range from 49% to 62%. There was variability in the data path resulting in a trend line that was not stable. There was an immediate change in percent correct from data point 1 to data point 2 (49% to 62%) and then an immediate decrease to the third data point (57%) and on to the final data point (50%). During the teacher training phase, the student achieved 100% on the next three data points indicating a stable trend. Once teacher training ended, the teacher did not collect any reading comprehension passages from Student 3, so there were no data points to graph. In the performance feedback meeting phase, there was a stable trend line. Each of the 7 data points was within 15% range of the trend line. The percent correct immediately increased from 88% to 100% where
it remained stable for the next five data points. When looking at changes between phases, there was an immediate change in percent correct from the student baseline phase (50% to 100%) indicating that the implementation of the intervention had an impact on the student’s scores. There was 100% non-overlapping data points between the baseline phase and the performance feedback phase. This indicates that the intervention was highly effective at improving the reading comprehension scores for student 3. There was an 80.3% increase in this subject’s reading comprehension scores between student baseline and performance feedback phases.

Figure 11: Student 3’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

**Summary of Classroom 1:** There are strong similarities between teacher 1’s graph and the graphs of her three students. During the teacher training phase all graphs showed an increasing trend line except that of student 3. For this student, it remained at 100% and showed an immediate change in percent correct from the student baseline phase (50% to 100%). It is difficult to make a comparison for the no support phase since two of the three students did not have any data points graphed. During the performance feedback phase, the mean number of intervention steps that the teacher completed was
97.8%. The mean percent correct for reading comprehension questions for student 1 and 2 was 87.7%. Student 3’s mean correct score was 98.3%. All of these scores were above the mean percentage scores. As the teacher’s adherence to the intervention steps increased during the performance feedback phase, the students also increased the number of reading comprehension questions they answered correctly. This could be attributed to the students’ growing ability to implement the reading comprehension strategies learned during the intervention to their own work as the teacher increasingly implemented the intervention with fidelity.

Classroom Teacher 2: There were two students from classroom 2 who qualified for the study (students 4 and 5).

Student 4 (Figure 12): The mean student baseline score for this student was 59% with a range from 25% to 87% (4 data points). There was variability in the data path creating an unstable trend line. Only 75% of the data points fell within 15% of the trend line. The percent correct increased for the first three data points but then there was a decrease in the percent correct between the third and fourth data point. During the teacher training phase, there was variability in the data path (5 data points) with an increasing stable trend line. Eighty percent of the data points fell within 15% of the trend line. In the no support phase, there was a stable increasing trend from 37% to 100%. In the performance feedback phase, there was variability in the data points (9 data points) with a range from 75% to 100%. The median point for this phase was 88%. The trend line was not stable because only 66% of the data points fell within 15% of the trend line. The level of percent correct jumped up and down due to the variability in the data points. Analyzing the data points between phases, there was an immediate decrease in percent correct between each of the phases. Between the student baseline and the teacher training phases, there was an immediate decrease from 62% to 50%. Between the teacher training and the no support phases, there was an immediate drop from 88% to 37% indicating that the withdrawal of support had an impact on student 4’s percent correct on reading comprehension questions. There was an immediate decrease once again between the no support and performance feedback phases from 100% to 75%. The data points did not
increase until the third data point (100%). From the third data point to the ninth data point, student 4’s percent correct did not fall below 75%. The mean percentage correct during this phase was 87%. This was a 47% increase from the mean baseline percentage to the mean percentage after the performance feedback phase. The percent of non-overlapping data points was 66% which indicates the intervention was moderately effective.

Figure 12: Student 4’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

![Graph showing percent correct data for different phases.]

_Student 5_ (Figure 13). Student 5’s mean percentage of reading comprehension questions answered correctly during the student baseline phase was 37.5% with a range from 25% to 50%. The trend line was not stable because only 50% of the data points were within 15% of the trend line. There was variability in the data points in phase 2, teacher training. The points continued on an erratic path for 5 data points with the median score at 25% and the mean percentage at 42.4%. The teacher did not collect any reading comprehension passages during the no support phase. This subject’s pattern of variability in data points within a phase continued during the performance feedback meeting phase. The range was 37% to 100% with a median score of 56% and a mean of 65.5%. The trend line was not stable due to the variability in data path. Only 50% of the data points fell within 15% of the trend line. There was an immediate decrease in percent correct between the student baseline and the teacher training phases from 50% to
13%. The percent correct remained stable when comparing the teacher training phase and the performance feedback phase (50%). The no support phase could not be compared to other phases due to the lack of data points obtained during the phase.

There was a 74% increase in the mean student baseline percentage and the mean percentage taken after the performance feedback meeting phase. Between the student baseline and the performance feedback meeting phase, 57% of the data points were non-overlapping indicating that the intervention for this child was minimally effective.

Figure 13: Student 5’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Summary of Classroom 2. Both student 4 and student 5 demonstrated variability in all recorded phases. It is difficult to discern any significant patterns because of this unevenness. However, it is important to note that the teacher and both students made progress in their scores from student baseline to the performance feedback meeting phase.

Classroom Teacher3: Four students qualified from this classroom (students 6, 7, 8, 9).
**Student 6** (Figure 14): The mean student baseline score for reading comprehension questions answered correctly for this student was 78.5% with a range from 75% to 88% (4 data points). Because one data point was an outlier at 88%, the trend line was considered unstable. Only 75% of the data points fell within 15% of the trend line. The percent correct increased between the first and second data point but then dropped back to its previous level for the third data point and stayed there for the fourth. During the teacher training, the no support and the performance feedback meetings phases, student 6’s scores hit 100% and remained there except for one data point which fell to 88% in the performance feedback meeting phase. The trend line remained stable at 100% for the teacher training phase (7 data points). There was only one data point in the no support phase at 100%. In the performance feedback meeting phase the trend line remained stable except for the aforementioned one-time drop to 88% (8 data points). The trend lines for phases 2 and 4 were considered stable because all data points fell within 15% of the trend line. Analyzing the data points between phases, there was an immediate increase in percent correct from the student baseline phase to teacher training phase from 75% to 100%. The level of percent correct remained stable between the teacher training and the no support phases and the no support and performance feedback meeting phases. There was a 25% increase from the mean student baseline percentage to the mean percentage after the performance feedback meeting phase. The percent of non-overlapping data points was 87.5% meaning that the intervention was moderately effective for student subject 6.
Figure 14: Student 6’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Student 7 (Figure 15): The mean student baseline reading comprehension percentage for this student was 81.8% with a range from 75% to 88% (4 data points). There was variability in the data path creating an unstable trend line. Only 50% of the data points fell within 15% of the trend line. During the teacher training phase, there was little variability in the data path (8 data points). Each data point was 100% except for one outlier, which decreased to 88%. In the no support phase, there was only one data point, which was 100%. In the performance feedback phase, there was little variability in the data points (8 data points) with a range from 88% to 100%. The median point for this phase was 100%. The trend line was stable because 100% of the data points fall within 15% of the trend line. The percent correct increased from 88% to 100%, where it remained for the rest of the performance feedback phase. Analyzing the data points between phases, there was an immediate increasing change in percent correct from 76% to 100% between the student baseline and teacher training phases. This indicates that the initiation of the intervention had a positive influence on student subject 7’s reading comprehension score. Between the teacher training and no support phases, the student’s score remained stable at 100%. Because there is only one data point in the no support phase, there can be no assumptions made about the impact of the withdrawal of teacher support on student subject 7’s score. Between the no support and the performance
feedback phases, there was an immediate decrease in scores from 100% to 88%; however, the scores returned to 100% at the second data point and remained there throughout the performance feedback meeting phase. The mean percentage correct during the performance feedback phase was 98.5%. This was a 20% increase from the mean student baseline percentage to the mean percentage after performance feedback meeting phase. The percentage of non-overlapping data points was 87.5% indicating that the impact the intervention had on student subject 7’s scores was moderately effective.

**Figure 15:** Student 7’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

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**Student 8** (Figure 16): The mean student baseline percentage for this student was 79% with a range from 76% to 88% (4 data points). There was no variability in the data path creating a stable trend line. All four of the data points fell within 15% of the trend line. The percent correct remained stable for the first three data points at 76% and then increased to 88% for the fourth data point. During the teacher training phase, there was no variability in the data path (7 data points) with a stable trend line. Each data point was 100%. In the no support phase, there was only one data point reported at 100%. In the performance feedback phase, there was no variability in the data points, as all 8 points were 100%. Analyzing the data points between phases, there was an immediate increase in from 88% to 100%
between the student baseline and teacher training phases. This indicates that the initiation of the intervention had a positive influence on student 8’s reading comprehension score. Between the teacher training and the no support phases, the student’s score remained stable at 100%. Because there is only one data point in the no support phase, there can be no assumptions made about the impact of the withdrawal of teacher support on the student subject 8’s score. Between the no support and the teacher training phases, the percent correct remained stable at 100%. All 8 data points in the performance feedback phase were stable at 100%. The mean percentage correct during the performance feedback phase was 100%. This was a 27% increase from the mean baseline percentage to the mean percentage after the performance feedback meeting phase. The percentage of non-overlapping data points was 100% indicating that the impact the intervention had on student subject 8’s scores was highly effective.

Figure 16: Student 8’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Student 9 (Figure 17): The student’s mean baseline for reading comprehension questions answered correctly was 75% with a range from 62% to 88% (4 data points). There was variability in the data path creating an unstable trend line. Only 75% of the data points fell within 15% of the trend line. The percent correct increased from the first to the second data points from 76% to 88%. It the teacher training
phase, there was variability in the data path (7 data points) with a stable decreasing trend line. One hundred percent of the data points fell within 15% of the trend line. In the no support phase, there were no data points recorded by the teacher. In the performance feedback phase, there was variability in the data points (8 data points) with a range from 88% to 100%. The median point for this phase was 100%. The trend line was stable because 100% of the data points fall within 15% of the trend line. Analyzing the data points between phases, there was an immediate increase in percent correct from 62% to 88% between the student baseline and the teacher training phases. This indicates that the initiation of the intervention had a positive influence on student 9’s reading comprehension score. As there was no data reported for the no support phase, there are no comparisons to be made between the teacher training and the no support phases. Between the teacher training and performance feedback phases, the student’s score remained stable at 88%. The second data point in performance feedback phase jumped to 100% and stayed there for a total of three data points. It then decreased to 88% for the fifth data point, followed by an increase to 100% for data points six, seven and eight. The mean percentage correct during the performance feedback phase was 96.6%. This was a 28.8% increase from the mean baseline percentage to the mean percentage after performance feedback meeting phase. The percentage of non-overlapping data points was 71% indicating that the impact the intervention had on student 9’s scores was moderately effective.

Figure 17: Student 9’s percent correct on reading comprehension questions for student baseline, teacher training, and performance feedback phases
**Summary of Classroom 3:** During the student baseline phase, all student scores were variable indicating that their reading comprehension scores were inconsistent. When teacher training began, all four students raised their scores. The students’ scores reflected the teacher’s learning and implementation of the reading comprehension intervention. Each of the four students reached 100% for the majority of the data points in the teacher training phase. It is difficult to make any assumptions about the no support phase as the teacher recorded only one data point during this phase for each of the four student subjects. The performance feedback meetings appeared to have a positive effect on the teacher’s adherence to the intervention which is reflected in the performance feedback phase scores of the students. The teacher and all four of the students achieved near perfect mean scores in the performance feedback meeting phase, with the teacher hitting a 96.3% mean number of intervention steps completed. The students recorded mean reading comprehension scores of 98.5%, 98.5%, 100% and 96.6%.

**Classroom Teacher 4:** Only one student qualified for the study from classroom 4 (student10).

**Student 10** (Figure 18): The student’s baseline mean percentage of reading comprehension questions answered correctly was 38.3% with a range from 12% to 75% (4 data points). There was no variability in the data path creating a stable increasing trend line. All of the data points fell within 15% of the trend line. It then increased to 50% on the third data point and 75% on the fourth. During the teacher training, there was variability in the data path (6 data points). It was an unstable trend line because only 33% fell within 15% of the trend line. During the teacher training phase, the subject only had one score higher than her highest score in the student baseline phase (83% vs. 75%). In addition, she had one score in the teacher training phase that matched the 75% high baseline score. In the no support phase, one data point demonstrates variability as it does not follow the trend line. The trend line increases but is not stable. Only 66% of the data points fall within 15% of the trend line. The median point is 62%. In the final phase, performance feedback, there was a range from 28% to 88%. The median point for this phase was 58%. The trend line was unstable because only 42% of the data points fall within 15% of the trend line. There was a lot of increase and decrease in percent correct between data points. It is difficult to make any assumptions about the impact the intervention had on student 10’s reading comprehension scores because
of the variability. Analyzing the data points between phases, there was an immediate decreasing percent correct change from 75% to 14% between the student baseline and the teacher training phases. While there was a significant drop from student’s 10 final baseline score of 75% to her first teacher training phase score of 14%, the drop was not as significant when considering her mean baseline score of 38.3%. The percent correct remained stable between phase 2 and 3 at 62%. There was an immediate decrease in percent correct between phases 3 and 4 from 88% to 74%. Student 10 exhibited variability within and between all phases to the degree that it is hard to make assumptions about the effect or lack of effect the intervention had on her reading comprehension scores. The mean percentage correct during the performance feedback phase was 67.4%. This was a 76% increase from the mean student baseline percentage to the mean percentage after the performance feedback meeting phase. The percentage of non-overlapping data points was 50% indicating that the impact the intervention had on student 10’s scores was minimally effective.

Figure 18: Student 10’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases
Summary of Classroom 4: Comparison of the performance feedback phase data of teacher 4 and the scores of student 10 illustrates that sometimes even perfect adherence to an intervention will not guarantee correlating student performance. Across eight implementation occasions, the teacher had 100% fidelity; nonetheless, student 10’s reading comprehension scores varied considerably in the performance feedback phase and the percent of non-overlapping data indicates that the intervention was barely minimally effective.

Classroom Teacher 5: There were two students from classroom 5 who qualified for the study (students 11 and 12). It should be noted that the SLP collected only 3 data points for each of the two students during the student baseline phase rather than the targeted goal of 4 that were collected in the other five classrooms. This was due to the death of a non-participating student in classroom 5 which prohibited data collection for one week.

Student 11 (Figure 19): The mean student baseline for reading comprehension questions answered correctly was 83% with a range from 80% to 90% (3 data points). There was variability in the data path but the trend line remained stable as 100% of the data points fell within 15% of the trend line. The percent correct remained stable from data point 1 to data point 2 but then showed an immediate increase in percent correct from data point two to three (80% to 90%). During the teacher training phase, there was variability in the data path (5 data points) with an increasing stable trend line from 66% to 100%. Eighty percent of the data points fell within 15% of the trend line. In the no support phase, no data points were recorded by the teacher. In the performance feedback meeting phase, there was variability in the data points (8 data points) with a range from 75% to 100%. The median point for this phase was 94%. The trend line was stable because 88% of the data points fell within 15% of the trend line. Analyzing the data points between phases, there was little to no change in percent correct between each of the phases. Between the student baseline and the teacher training phases, there was a slight decrease from 90% to 88%. As there were no data points in the no-support phase, the teacher-training phase was compared with the performance feedback phase. There was no percent correct change, the teacher training phase’s final data point was 100% and the performance feedback’s initial data point was 100%. The mean
percentage correct during the performance feedback phase was 95.4%. This was a 14.6% increase from the mean student baseline percentage to the mean percentage after the performance feedback meeting phase. The percent of non-overlapping data points was 75% which indicates the intervention was moderately effective.

Figure 19: Student 11’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Student 12 (Figure 20): Student 12’s mean student baseline percentage of reading comprehension questions answered correctly was 37% with a range from 12% to 62% (3 data points). There was no variability in the data path creating a stable trend line. All the data points were within 15% of the trend line. The percent correct increased from 12% in the first data point to 37% in the second data point and again to 62% in the third data point. During the teacher training phase, there was variability in the data path (5 data points). The trend line was decreasing and unstable with only 66% of the data points falling within 15% of the trend line. In the no support phase, the teacher did not record any data points for student 12. In the performance feedback meeting phase, there was variability in the data points (8 data points) with a range from 75% to 100%. The median point for this phase was 90%. The trend line was unstable because only 75% of the data points fell within 15% of the trend line. There were many percent correct changes in this phase with no two consecutive data points being at the same level. Analyzing the data points between phases, there was an immediate increasing percent correct change from 62% to 88% between the student baseline and the teacher training phases. This indicates that the initiation of the
intervention had a positive influence on student 12’s reading comprehension score. No comparisons can be made between the teacher training and the no support phases because no data points were recorded by the teacher in the no-support phase. However, between the teacher training and the performance feedback phases, there was an immediate increase in percent correct from 37% to 80%. The percent correct never dropped again below 75% indicating that the performance feedback meetings had an impact on student 12’s reading comprehension scores. The mean percentage correct during the performance feedback phase was 86%. This was a 132% increase from the student mean baseline percentage to the mean percentage after the performance feedback meeting phase. The percentage of non-overlapping data points was 100% indicating that the impact the intervention had on student 12’s scores was highly effective.

Figure 20: Student 12’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

**Summary of Classroom 5:** Student 11 and student 12 achieved very different reading comprehension scores in the student baseline phase. By the performance feedback meeting phase, a majority of their scores were above the trend line. Student 11 had a mean student baseline score of 83.3% while student subject 12’s mean student baseline score was just 37.7%. However, by the time they reached the performance feedback phase the two students’ scores were more in line with each other, with student 11 achieving a mean performance feedback score of 95.4% and subject 12 recording a mean score
of 86%. This can be an indication that the intervention can be effective regardless of how well or poorly the students perform during the student baseline phase. Although classroom teacher 5 performed poorly in the no support phase, completing only 56% of the intervention steps and collecting no data points for either student, she improved her fidelity in the performance feedback phase, reaching 100% fidelity in the final five data points. This appeared to have a positive influence on the students’ scores.

Classroom Teacher 6: There were four students from classroom six who qualified for this study (students 13, 14, 15 and 16).

Student 13 (Figure 21): The mean student baseline percentage for reading comprehension questions answered correctly was 28.3% with a range from 0% to 63% (4 data points). There was variability in the data path creating an unstable trend line. Only 50% of the data points fell within 15% of the trend line. The percent correct remained stable from the first to the second data points (0% to 0%), increased for the third data point (50%) and then increased again from the third to the fourth data points to 63%. During the teacher training phase, there was little variability in the data path (4 data points) with an immediate increase in percent correct from 62% to 88% where it remained stable across the second, third and fourth data points. The trend line was stable with 100% of the data points falling within 15% of the trend line. In the no support phase, there were four data points obtained. The trend line was decreasing and unstable because only 25% of the data points fall within 15% of the trend line. The level of percent correct showed an initial increase from 50% to 75% but then fell to 62% at the third data point and then 26% at the fourth data point. In the performance feedback meeting phase, there was variability in the data points (8 data points) with a range from 50% to 100%. The median point for this phase was 100%. The trend line was increasing and unstable because only 75% of the data points fall within 15% of the trend line. Student 13 recorded high and increasing scores for the first five data points (88%-88%-88%-100%-100%) but then fell to 50% at the sixth data point. He recovered to 100% at the seventh data point but then again fell to 50% at the eighth data point. Analyzing the data points between phases, there was no percent correct change between phase 1 and phase 2 matching at 62%. There was an immediate decrease in percent correct from 88% to 50% between the teacher training and the no support phases. This indicates
that the withdrawal of support had an immediate impact on student 13’s percentage correct. Between the no support and the performance feedback phases, there was an immediate increase in percent correct from 26% to 88% suggesting that performance feedback meetings had an impact on teacher adherence to the intervention, which positively impacted the student’s reading comprehension scores. The mean percentage correct during the performance feedback phase was 83%. This was a 193.2% change from the mean student baseline percentage to the mean percentage after the performance feedback meeting phase. The percentage of non-overlapping data points was 75% indicating that the impact the intervention had on student 13’s scores was moderately effective.

Figure 21: Student 13’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Student 14 (Figure 22): The mean student baseline percentage for reading comprehension questions answered correctly was 37.3% with a range from 25% to 50% (4 data points). There was variability in the data path creating an unstable trend line. Only 50% of the data points fell within 15% of the trend line. The percent correct increased from the first to the second data points (37% to 50%) then fell back to 37% at the third data point and 25% at the fourth data point. During the teacher training phase, there was variability in the data path (5 data points) with an immediate decrease in percent correct from 75% to
25%. The percent correct then increased to 88% and stayed there for the fourth and fifth data points. The trend line was unstable with 40% of the data points falling within 15% of the trend line. In the no support phase, there were three data points obtained. The trend line was decreasing and unstable with 67% of the data points falling within 15% of the trend line. The percent correct showed an immediate decrease from 88% to 75% and then fell to 25% at the third data point. In the performance feedback meeting phase, there was variability in the data points (8 data points) with a range from 62% to 88%. The median point for this phase was 69%. The trend line was decreasing and unstable because only 62% of the data points fall within 15% of the trend line. The percent correct initially remained stable at 88% but then dropped to 75% at the third data point and 62% at the fourth data point. It then climbed back to 75% at the fifth data point, then 88% at the sixth, falling to 62% at the seventh data point and recovering to 88% at the eighth data point. Analyzing the data points between phases, there was an immediate increasing percent correct change from 25% to 75% between the student baseline and the teacher training phases. This indicates that the initiation of the intervention had a positive impact on student 14’s reading comprehension scores. Between the student baseline and the teacher training phases, the percent correct remained stable at 88%. The percent correct change between the no support phase and the performance feedback meeting phase is more dramatic because the student’s percent correct dropped to 25% in his performance feedback phase 3 score. There is an immediate level of percent correct change between the no support and the performance feedback phases from 25% to 88%. This reflects the positive influence that performance feedback meetings had on teacher implementation of the intervention, which positively impacted student reading comprehension scores. The mean percentage correct during the performance feedback phase was 78.3%. This was a 110% change from the mean student baseline percentage to the mean percentage after performance feedback meeting phase. The percentage of non-overlapping data points was 100% indicating that the impact the intervention had on student 14’s scores was highly effective.
Student 15 (Figure 23): The mean baseline percentage of reading comprehension questions answered correctly was 43.8% with a range from 25% to 50% (4 data points). There was variability in the data path creating an unstable trend line. Only 75% of the data points fell within 15% of the trend line. The percent correct remained stable from the first to the second data points (50% to 50%), decreased to 25% at the third data point, and then increased from the third to the fourth data points to 50%. During the teacher training phase, there was variability in the data path (5 data points) with an immediate increase in percent correct from 55% to 75% and then to 88% at the third data point. It then fell back to 75% and remained there for data points four and five. The trend line was unstable with 62% of the data points falling within 15% of the trend line. In the no support phase, there were three data points obtained. The trend line was decreasing and unstable because only 67% of the data points fall within 15% of the trend line. The percent correct showed an initial decrease from 75% to 50% but then remained stable at 50% at the third data point. In the performance feedback meeting phase, there was variability in the data points (7 data points) with a range from 50% to 88%. The median point for this phase was 88%. The trend line
was decreasing and unstable because only 71% of the data points fall within 15% of the trend line.

Subject 15 recorded initially increasing levels of percent correct, from 50% at the first data point to 75%, then remaining stable at 75% for data point three and increasing to 88% at data point four. The percent correct then immediately decreased to 62% and remained there at data points five and six, with a final increase in level to 75%. Analyzing the data points between phases, there was an immediate increase in percent correct between the student baseline and the teacher training from 50% to 55%. The percent correct remained stable between the teacher training and the no support phases at 75%. It again remained stable between the no support phase and the performance feedback phase at 50%. However, it then increased in level of percent correct to 75% at the second data point in the performance feedback meeting phase and never dropped below 62% through that phase’s six remaining data points. The mean percentage correct during the performance feedback phase was 69.6%. This was a 59% change from the mean student baseline percentage to the mean percentage after performance feedback meeting phase. The percentage of non-overlapping data points was 86% indicating that the impact the intervention had on student 15’s scores was moderately effective.

Figure 23: Student 15’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases
**Student 16** (Figure 24): The mean student baseline percentage for reading comprehension questions answered correctly was 70.8% with a range from 63% to 75% (4 data points). There was variability in the data path with a decreasing stable trend line. One hundred percent of the data points fell within 15% of the trend line. The percent correct remained stable from the first to the second data points (75% to 75%), decreased for the third data point (70%) and then decreased again from the third to the fourth data points to 63%. During the teacher training phase, there was variability in the data path (5 data points) with an immediate decrease in level of percent correct from 62% to 50% followed by an increase to 62% at the third data point, 88% at the fourth data point and 100% at the fifth data point. The trend line was increasing and stable with 80% of the data points falling within 15% of the trend line. In the no support phase, there were four data points obtained. The trend line was decreasing and unstable because only 75% of the data points fall within 15% of the trend line. The percent correct showed an initial decrease from 63% to 50% but then increased back to 63% and finally fell to 26% at the fourth data point. In the performance feedback meeting phase, there was variability in the data points (7 data points) with a range from 26% to 75%. The median point for this phase was 62%. The trend line was decreasing and unstable because only 57% of the data points fall within 15% of the trend line. Student 16 began at her highest level for performance feedback phase at 75% but immediately decreased to 50% at data point 2, then increased to a level of 62% where it remained stable for the third, fourth, fifth and sixth data points. It finally fell to 26% for the seventh and final data point. Analyzing the data points between phases, there was no percent correct change between the student baseline and the teacher training phases matching at 62%. There was an immediate decrease in percent correct from 100% to 63% between the teacher training and the no support phases. This indicates that the withdrawal of support had an immediate negative impact on student 16’s percentage correct. Between the no support and the performance feedback phases, there was an immediate increase in percent correct from 26% to 75% suggesting that performance feedback meetings had an impact on teacher adherence to the intervention, which positively impacted the student’s reading comprehension scores. The mean percentage correct during the performance feedback phase was 57%. This was a 19% decreasing change from the mean student
baseline percentage to the mean percentage after performance feedback meeting phase. The percentage of non-overlapping data points was 0% indicating that the impact the intervention had on student 16’s scores was ineffective. However, it is noteworthy that student 16 recorded an outlier of 26% in the performance feedback phase, which lowered the mean for that phase.

Figure 24: Student 16’s percent correct on reading comprehension questions for student baseline, teacher training, no support and performance feedback phases

Summary Classroom 6: Teacher 6 was in the teacher training phase for the longest period of time (13 data points). During this phase, after an initial gradual increase in adherence from 70% to 100% over 4 data points, she maintained the 100% accuracy for intervention adherence on 8 out of the last 9 data points. This adherence level remained stable between her teacher training and the no support phases. Three of the students’ data paths (students 13, 14, 16) took a similar course as the teacher’s during the teacher training phase. As did the teacher in the teacher training phase, the three students had an overall increase in scores and finished the phase with their highest percentage correct. Student s 13 and 14 demonstrated stable data points for the last three at 88%. Once support was withdrawn during the no support phase, two of the students’ scores decreased immediately (students 13 and 16). The other two students (14 and 15) kept stable levels of percent correct at the first data point of the no support phase, but then the level of percent correct decreased for the rest of the phase. During the teacher’s no support
phase, the students’ percent correct did not decrease until the fourth data point. Once performance feedback meetings were introduced, there was an immediate increase in the teacher’s adherence to the intervention as well as an immediate increase in percentages correct by 3 of the 4 students (13, 14 and 16). The fourth student’s percent correct remained stable but increased at the next data point. For this class, it appears that the withdrawal of support negatively impacted two of the students’ scores on the reading comprehension passages and may indicate a negative impact on the other two. Because there was not an immediate decrease in percent correct between phases for these two, it cannot be stated conclusively that the withdrawal of support had an effect on the scores. However, scores for the students in question did drop after the initial data point in the no support phase and remained low. So there may be some indication that the withdrawal did in fact negatively impact these scores. The introduction of performance feedback meetings supported the teacher’s adherence to the intervention, which positively influenced the student outcomes for this phase.

**CBM-Maze Scores:** All sixteen students had a total of 10 Maze scores each. The first two served as the baseline scores obtained prior to the initiation of the first phase of the teachers. The last eight were taken during the performance feedback meeting phase. The CBM-Maze was used to monitor the progress of the students during the 8 week intervention period, observing whether each data point followed the aim line. The aim line was chosen for this data analysis as a marker for weekly progress because it is the accepted reference line used by school districts. When analyzing the student reading comprehension percentage correct, the level of percent correct was also used in addition to the trend line; however, it was decided to use only the aim line for the CBM-Maze. By following the aim line, it is assumed that the student would eventually reach benchmark. If a data point falls below the aim line, then the intervention might not be as effective as necessary to reach the desired outcome (grade-level benchmark); the intervention might need to be adjusted or applied with more intensity. If the scores fall above the trend line, then less support seems needed. See Figure 25 for the graphs for each individual student.

Twelve of the sixteen students reached benchmark scores for their grade, for a percentage of 75%. They did so in a predictable manner, with their scores following the aim line and eventually
reaching grade-level benchmark. This indicates that the students’ scores increased toward benchmark over time the longer they participated in the intervention.

Four of the sixteen students, or 25%, did not reach benchmark scores for their grades. Student 4’s scores were following the aim line until data point 7; at that point, his scores for the last three data points remained stable but below the aim line resulting in his never reaching grade-level benchmark. Student 5 reached a score above the aim line early, but his scores became stable after that and he never reached benchmark. Student 12 reached the aim line only once, but her scores remained stable throughout the intervention. Student 15’s scores followed the aim line for the first four data points, but then his scores became stable and did not follow the aim line, and he never reached benchmark.
Figure 25: Students’ baseline and intervention maze scores

Student Subject One

Student Subject Two

Student Subject Three

Student Subject Four

CBM-Maze Number 106
Student Subject Nine

CBM-Maze Number

Number Correct

1 2 3 4 5 6 7 8 9 10

Student Subject Ten

CBM-Maze Number

Number Correct

1 2 3 4 5 6 7 8 9 10

Student Subject Eleven

CBM-Maze Number

Number Correct

1 2 3 4 5 6 7 8 9 10

Student Subject Twelve

CBM-Maze Number

Number Correct

1 2 3 4 5 6 7 8 9 10
Student Grades: The third measure to determine whether the intervention had an impact on student outcomes was an analysis of their grades before and after the intervention. Since the 16 students in the sample group were tested before and after the intervention, and thus their scores could be considered to be dependent upon each other, the paired t-test was used for this analysis. One t statistic was calculated from the data of the 16 subjects before and after the intervention. For a paired t test it is necessary to calculate the differences between all subject pairs. Since t calculated (3.01) was greater than t critical (2.602), there is 99% confidence that the intervention caused an improvement in students’ grades. See table 6 for a table of the results.

Table 6: Paired t-test results of student grades, pre- and post-intervention

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<th>Average Grade After Intervention</th>
<th>Difference Between two Means for All Subjects</th>
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Summary of Student Outcomes: In all three measures -- reading comprehension questions, CBM-Maze scores and student grades -- the students showed improvement in their scores from baseline to post-performance feedback meeting phase. In the first measurement, reading comprehension passages, the intervention had a moderate to high effectiveness on 13 out of 16 students’ performances. In the second measurement, CBM-Maze, the scores initially fell below grade-level benchmark; however, progress monitoring data showed that 12 out 16 students’ Maze scores followed the aim line and reached grade-level benchmark. And in the third measurement, student grades, there was an overall 99% confidence that the intervention resulted in improvement in students’ reading comprehension scores.
Chapter V

Discussion

Response to Intervention is a service delivery model that calls for evidence-based instruction for all students. The underlying purpose driving this study was to determine whether a reading comprehension intervention could be implemented under the guidelines of RtI and impact student outcomes. Results would help determine if RtI is a viable model for distinguishing between children at risk for reading comprehension difficulties and those with a true reading disability. Three research questions explored whether a specific collaboration procedure would support regular education teachers’ implementation of reading comprehension interventions in the classroom; whether the regular education teacher’s attitude toward the collaboration procedure and intervention effectiveness would impact treatment adherence; and, whether using a systematic intervention would impact children’s reading comprehension scores. To answer these questions, key RtI components were used in a systematic collaboration procedure that implemented a reading comprehension intervention in the classroom: collaboration, treatment adherence, progress monitoring and student outcomes. The intervention taught the at-risk students four strategies to support their reading comprehension: predicting/making inferences, previewing vocabulary, comprehension monitoring/answering questions and understanding complex syntax. The intervention strategies were taught to all children during small group instruction. The members of the group were children identified as being at-risk for reading comprehension difficulties. The systematic procedure required the teacher to implement the intervention and collaborate weekly with the SLP to discuss treatment adherence, concerns with the intervention, and student progress, as well as plan for the next week’s lesson. The SLP collected permanent products to evaluate the percentage of treatment adherence by the teacher. Progress-monitoring tools were used to evaluate student outcomes and to determine the overall effect of the intervention on student grades.
As stated in the Review of the Literature section, collaboration is key to RtI. This study investigated the specific collaboration between a regular education teacher and an SLP. The two worked together to identify a student at risk for reading comprehension difficulties, planned the intervention, oversaw treatment adherence, monitored progress and made intervention changes as needed. The results from this study revealed that the collaboration between the SLP and regular education teacher could work successfully in the RtI model by identifying and implementing an intervention to children at risk for reading comprehension difficulties. By supporting intervention adherence, the collaboration achieved two critical features of RtI: supporting student outcomes and collecting information through progress monitoring to differentiate between at-risk students and students with a true reading disability.

Intervention adherence is necessary to determine whether a student is having difficulty because of a true disability or because poor instruction or cultural or socioeconomic differences. The collaboration procedure for this study helped ensure that the teacher adhered to the intervention and that the intervention was implemented with fidelity. A multiple baseline across subjects design found that weekly performance feedback meetings did have an impact in supporting three of the six teachers’ adherence to the reading comprehension intervention. For the other three teachers, it cannot be conclusively stated that the intervention supported treatment adherence; for those three teachers, the performance feedback meetings were determined to be ineffective because the percent of non-overlapping data points was 0% between the no support phase and the performance feedback meeting phase. On the other hand, it cannot be conclusively stated that the performance feedback meetings had no effect on treatment adherence. During the performance feedback meeting phase, the median adherence percentage for each teacher was 100%. This was an increase in percentage from the median adherence percentage during the no support phase, which was 75%. One explanation could be that the high data points during the beginning of the no support phase were a residual carryover from the teacher training phase.
The adherence to the intervention was determined through the use of permanent products. During the intervention, the teachers and students were required to complete activities recorded on worksheets and collected by the SLP. As part of the collaboration procedure the percentage of completed intervention steps was calculated and any omitted steps were discussed.

Typically permanent products are not collected; rather, interventions are designed and checked after 6 to 8 weeks of implementation. Permanent products allow for the continued monitoring of adherence, eliminating observer bias. The permanent products also allow for immediate correction when the intervention is not being carried out with fidelity. Teacher fidelity is key to obtaining reliable student outcomes.

These weekly meetings supported the teacher in several ways (discussed concerns, adjusted intervention, reminded teacher of the importance of the intervention). Since the intervention was being adhered to with fidelity, the SLP had confidence that the student outcomes were legitimate.

Past research has shown that treatment adherence helps guarantee that the intervention is implemented with fidelity (Noell et al., 2002). The results from this study replicated the findings of past studies (Witt et al., 1997; Noell, 1997; Mortenson et al., 1997 Mortenson & Witt, 1998, Noell et al., 2001, Noell et al., 2002), which also found performance feedback meetings to be effective in increasing treatment adherence by regular education teachers.

This study also included recommendations by Ihlo (2004), by including a problem-solving component during the performance feedback meetings. The teachers were asked if any changes needed to be made to the intervention. Teacher 6 asked if the subjects could record information in their reading notebooks instead of using the intervention sheets developed by the SLP. All of the teachers expressed difficulty in completing a reading comprehension passage daily. Teacher 2 asked if her students could highlight the title and vocabulary words in the text because the writing was a laborious task for them.

The teachers were presented with graphs of student performance. This step was appreciated by all of the teachers, who commented to the SLP that the graphs motivated them to adhere to the intervention.

The effect that collaboration during the performance feedback meetings had on intervention adherence is
evidenced in the results from the study. During the teacher training phase, the teachers learned the intervention steps with fidelity. All percentages were low initially but increased by the end of the teacher training phase. Each teacher reached 100% accuracy for intervention adherence during the training phase. When support was taken away (no support or collaboration) during the no support phase, the teachers’ adherence scores dropped. In fact, for five of the six teachers, adherence scores not only dropped during the no support phase, they dropped to an adherence level at or below their lowest score in the teacher training phase. By the time they reached the performance feedback phase, when collaboration began again, they all had reached that 100% adherence for the majority of data points. Not only did they reach 100% implementation, they all remained at a high level. For example, teacher 1 achieved 100% adherence for 6 of 8 data points; teacher 2, 4 of 8; teacher 3, 7 of 8; teacher 4, 8 of 8; teacher 5, 5 of 8; and teacher 6, 7 of 8. Teacher 6, in particular, was very conscientious about implementing the intervention throughout all phases. Once she learned the intervention in the teacher training phase, only 4 of her 23 data points across all phases failed to meet 100% adherence. Theoretically, the adherence change between phases is the measure for determining the impact the independent variable has on the dependent variable. In this question, the amount of support is the independent variable. There were immediate adherence changes in 50% of the recorded phase changes: 3 of the 6 teachers showed an immediate adherence between the teacher training and the no support phases, and 3 of the 6 showed an immediate adherence increase between the no support and the performance feedback meeting phases. Nonetheless, in all cases the teachers reached and almost perfectly maintained 100% adherence during the performance feedback meeting phase.

In addition, during the performance feedback phase, there was little variability between teachers in the adherence, trend and amount of change in intervention adherence. It appears that once the teachers understood the intervention, they adhered. In addition, with so few data points, it is difficult to determine why one data point might have fallen. With only eight data points in the performance feedback meeting phase, one lower data point can skew the results even if the other seven data points are 100%. For example, there might be extenuating circumstances that could prevent the teacher from implementing the
intervention yet have little to do with how well she planned to adhere to the intervention, such as time constraints, intervening events, and variances in student behavior. With only eight opportunities to implement the intervention, one non-compliant day has a bigger negative effect on the teacher’s overall performance than if she had more opportunities to implement the intervention.

The fact that all six of the teachers reached 100% intervention adherence in the teacher training and the performance feedback phases might suggest that they had established a trust with the SLP or that the constant reminders were having a desired effect as the intervention process advanced. The teachers’ growing level of trust in the SLP was evidenced in several ways. For starters, they began confiding in the SLP that they initially were weary of the intervention but had seen it have a progressive impact. In addition, the teachers told the SLP that the students surprisingly enjoyed completing the permanent products, and the teachers sought the SLP’s advice increasingly as the intervention advanced. Without support, the teachers fared less well. This could indicate that the teachers needed the support of the SLP to maintain the high intervention adherence levels that they displayed in the teacher training and the performance feedback phases. It is likely that this was the case because the teachers were being held accountable for their adherence, fostering both excitement and pride with the teachers. In addition the teachers’ realization that the intervention was positively impacting the students also drove adherence.

During the no support phase, the teachers forgot critical steps of the interventions. Without the collaboration and weekly meetings with the SLP, the intervention was not adhered to and intervention fidelity faltered. This supports the findings from past research in using information and modeling to train preschool teachers to use language enhancement strategies during dialogic book reading (Sickman, 2007) and during interaction in classroom centers (Combs, 2009). In both studies, teachers implemented the strategies immediately after the training but complete maintenance of long-term implementation without continued support was not observed. There are no conclusive findings as to why the steps were forgotten because there are many factors beyond the control of the SLP and teachers, such as classroom crises, changing demands of the administration and human error. However, three factors included in the performance feedback meetings were likely responsible for adherence: graphs of student progress;
reminder of the importance of the omitted intervention steps; and bestowal of more decision making
power on to the teachers, including the freedom to choose the subjects in which to implement the
intervention and choosing the vocabulary words to target. Although the above topics were discussed
during the weekly feedback meetings, the primary focus was on the students’ outcomes. By sharing and
discussing the progress the students were making, the teachers were motivated to implement the
intervention to further support the students.

Progress Monitoring and Collaboration

Progress monitoring is another critical element of an RtI model, and its weekly implementation in this
study was supported by the collaboration between the SLP and teacher. For this study, the CBM-Maze
was administered weekly to monitor the students’ progress. During the weekly performance feedback
meetings, the SLP collected the completed CBM-Maze and gave the teachers new ones to be administered
during the week. The teacher and SLP also discussed the students’ scores that were graphed and how
they compared to the aim line. If the scores were below the aim line, the intervention intensity was
increased. If the scores followed or were above the aim line for two consecutive weeks, the level of
prompts and supports were decreased. The graphs served as a reminder to discuss the CBM-Maze. The
ultimate goal of RtI is to determine how the student is responding to the intervention. The graphs not
only helped track how the students’ reading comprehension skills were affected by the intervention, but
they also kept the importance of progress monitoring at the forefront.

For the students whose data points followed the aim line closely (1, 2, 3, 10, 11), the teacher adjusted
the intervention over time by decreasing intensity. However, if they were below the aim line, the teacher
increased the intensity. For example, student 12’s score consistently fell below the aim line, so her
teacher took additional measures to increase intervention intensity. The teacher instituted a book club
with student 12 and two other students who were also below benchmark. This was done in addition to the
reading interventions. During the book club, the teacher practiced the same strategies used in the
intervention but using a chapter book that she read with the group. Nonetheless, student 12 never
achieved benchmark. In fact, over time she fell further from the aim line. In her case, the results of
intervention suggest that there she may need additional support. Her performance did not respond to the intervention despite increasing levels of support. RtI research tells educators that a child who does not respond to increasing levels of intervention in the classroom could be at risk for a learning disability. The three other students who never made benchmark (4, 5 and 15) also received more intensive intervention without success. When the below-benchmark scores for these four students were compared to their percent correct on reading comprehension questions, three (4, 12, 15) showed an increase in the number of questions they answered correctly. The difference in these scores (one score never reaching benchmark and one score improving) may be attributed to the different types of tasks. The CBM-Maze was a three-minute measure requiring the students to choose the correct answer out of three. It relied on the student’s understanding of the text and ability to choose the correct word that would be both syntactically and semantically correct. The reading comprehension questions were not timed but required comprehension of a grade-level passage. The students could go back to the passage to check their answers. The intervention proved to be minimally effective in improving the reading comprehension scores of student 5. At the end of this study, these four students (4, 5, 12, 15) were referred to Tier 3 for more intensive interventions and possible assessment.

Student outcomes

Reading comprehension passages

Evaluating the data within phases does not provide concrete evidence as to whether students’ reading comprehension scores are impacted by how well the teacher adheres to the intervention. Nonetheless, a different story emerges when looking at the entire intervention process targeting reading comprehension, from student baseline scores to scores after the inclusion of performance feedback meetings. Of 16 students who participated across six classrooms, the intervention was minimally effective for only two, and it was ineffective in improving reading comprehension questions answered correctly for only a single student. On the other hand, 13 of the 16 students – regardless of their teacher, classroom or other factors — had reading comprehension results that showed that the intervention was moderately effective or highly effective. Results from eight of them showed the intervention to be moderately
effective, while it was deemed to be highly effective for five. All of the students but one achieved higher percentage correct on reading comprehension questions from their student baseline scores.

Performance feedback appears to have had a positive effect on the teachers who perfected the intervention, which allowed the students to learn strategies to support their comprehension. However, the trend in classroom 4 does not mirror the other five classrooms; despite perfect adherence to the intervention by the teacher, the sole student in classroom four continued to struggle, and her reading comprehension scores showed a lot of variability. In this case, the pattern seen throughout the other five classrooms did not hold true, as the teacher’s perfect adherence was not enough to consistently result in improved student outcomes. It can be hypothesized that this teacher already provides good evidence-based instruction at Tier 1, meeting the needs of the at-risk students in her classroom. It can be further hypothesized that this student is the only student in classroom 4 with a true disability. It should be noted, however, that this student did reach grade-level benchmark on the CBM-Maze. Another factor to consider when analyzing reading comprehension scores is how the child is asked to demonstrate knowledge. The breakdown might not be in the child’s reading comprehension skills but, rather, in his ability to effectively express that comprehension in the manner in which he is being asked. Evaluation of spoken and written language skills is an important factor to consider in designing academic interventions.

Student Grades

The paired t-test revealed, with 99% confidence, that the intervention had an impact on student grades when grades were compared before and after intervention. The other two student outcome measures, comprehension questions and CBM-Maze, are engineered to provide glimpses of possible student performance; the student grades provide the typical assessment measure used by schools. This highlights exciting information: The RtI model can impact student outcomes and truly support at-risk students. Through collaboration, the teachers adhered to a reading comprehension intervention that taught students strategies to use during reading. By using these strategies, the students achieved greater success in core content areas. This illustrates a key fact: Students can generalize what they learn during an intervention program and apply it to their classroom assignments. Through the RtI process, at-risk students who might
have been diagnosed with a learning disability under previous models were taught the skills needed to improve their grades and reach benchmark.

Teacher Attitude and Treatment Adherence

The Spearman Coefficient determined that there was not a significant relationship between teachers’ attitude toward the intervention and their treatment adherence. All the teachers had a high percentage of intervention adherence. Their responses on the teacher survey revealed that they were all generally happy with the intervention and the collaborative procedure. On a Likert scale from 1 to 5 (5 being the highest), three teachers responded with all fives. The other three did not score any item below a four. Some of the teachers even wrote side notes such as, “Excellent Intervention” and “I am still using it in the classroom.” This is further evidence that the teachers were pleased with the intervention and procedure. These teachers believed in intervention and collaboration from the start of the study and were willing participants. The results might have been different if the study participants had been required by their administration to participate but did not value collaboration or understand RtI. Instead, this study sought volunteers; therefore, it could be expected that the teachers already vested in collaboration and intervention would be the first ones to sign-up.

Limitations and Future Research

The study was limited in the number of teachers and students. The subject pool was limited to one school district in one city. With a larger and more diverse pool of subjects, there would be more diverse data from which to draw conclusions. Research should be conducted in a variety of districts types, such as urban, suburban and rural. This would allow for variety in a number of factors, including socioeconomic background, district philosophies, degree of RtI expertise and degree of parental support. All of these can impact the results. Future research could compare and contrast the successful implementation of reading comprehension interventions to at-risk children while taking these factors into account.

Following the RtI protocol, this study followed students through the intervention process. Initially, 16 students were identified as being at risk for a reading comprehension disorder. Implementation of a
reading comprehension program through the use of a systematic collaboration procedure between an SLP and teacher proved to successfully impact student progress. At the end of the study, four children were identified as needing more intensive instruction and possible further assessment because of limited progress toward grade-level benchmark. Future research should determine whether the subjects who fail to make progress during the intervention period eventually are the same children who qualify for special education services. An extension of this project would entail seeing whether this procedure actually distinguished between children with a true learning disability and those without one. Future studies should follow the children for a longer period of time and should complete periodic checks on their performance for an extended period of time. This would help determine whether the children who reached benchmark during the intervention period maintained grade-level performance when the intensive support was decreased. It also would help determine whether the procedure truly identified children with learning disabilities. In addition, future research should include feedback from the students who participated, in the form of a survey or interview. This information may help explain student outcomes based on their views of the intervention. For example, if the students found the task boring, that could affect their answers on the reading comprehension passages.

Implications

This study strengthens the current body of literature on collaboration by showing that an SLP and teacher can identify at-risk children, plan and implement an intervention that is conducted in the classroom by the teacher, use permanent products to track treatment adherence and monitor student progress. In this study, the teacher and SLP collaborated to teach students reading comprehension strategies. Seventy-five percent of the students made progress, according to the CBM-Maze. As past research has shown, adhering to an intervention and implementing it with fidelity is a challenge. If an intervention is not adhered to, then valid student outcomes may not be obtained. This study found that collaboration between an SLP and teacher did support treatment adherence. By ensuring treatment adherence, it demonstrated that a reading comprehension intervention can support children at risk for a reading comprehension disability. The increases in students’ grades demonstrated that students are
capable of learning strategies that will support their comprehension of material in the curriculum and that a combination of comprehension monitoring, previewing vocabulary, understanding syntax and making inferencing can positively support student outcomes. This was evident in all grade levels represented in this study (2, 3, 4, 6). This implies that teaching reading comprehension strategies should be part of the curriculum; further, it shows that it can be embedded into classroom instruction throughout the grades and need not stop once children learn to decode. The results also indicate that the SLP does not have to be the primary service delivery provider in areas related to reading comprehension difficulties. The teacher and the SLP can join forces, tapping into the areas of expertise of each to provide interventions that are both effective and implementable in the classroom. This study also showed that the intervention can be successful in the real world, fraught with time constraints, personal and school issues that are beyond the control of the educators.

This research project set out to determine whether a systematic, collaborative procedure would support teachers’ adherence to a reading comprehension intervention and, in turn, improve student outcome measures under the RtI model. The process turned out to validate the power that collaborative teams can wield in the classroom, even under less than ideal circumstances. Using a service delivery model that monitors student progress, makes adjustments as needed, involves collaboration, and adapts itself to the varied and changing needs of individual students, educators can bring at-risk students up to grade-level performance. Teaching is a difficult endeavor in the best of environments, particularly when working with at-risk students. In the case of the subjects of this research, poverty and the strains it puts on the teachers and students were additional stressors. Nonetheless, even under these real life conditions, the RtI service delivery model provided a framework for success in supporting at-risk students.


LerVag, A., & Aukrust, V. (2010). Vocabulary knowledge is a critical detriment of the difference in reading comprehension growth between first and second language learners.


development instruction for expository text comprehension. *Teaching Exceptional Children*, 47-52


Preventive and remedial approaches, Bethesda, MD, NASP Publications.


Appendix A

DIBELS Oral Reading Fluency Norms

Second Grade: Three Assessment Periods Per Year

<table>
<thead>
<tr>
<th>DIBELS Measure</th>
<th>Beginning of Year</th>
<th>Middle of Year</th>
<th>End of Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Months 1 - 3</td>
<td>Months 4 - 6</td>
<td>Months 7 - 10</td>
</tr>
<tr>
<td><strong>Scores</strong></td>
<td><strong>Status</strong></td>
<td><strong>Scores</strong></td>
<td><strong>Status</strong></td>
</tr>
<tr>
<td><strong>NWF-CLS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 29</td>
<td>Deficit</td>
<td>Not administered during this assessment period.</td>
<td>Not administered during this assessment period.</td>
</tr>
<tr>
<td>30 - 49</td>
<td>Emerging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 and above</td>
<td>Established</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ORF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 25</td>
<td>At Risk</td>
<td>0 - 51</td>
<td>0 - 69</td>
</tr>
<tr>
<td>26 - 43</td>
<td>Some Risk</td>
<td>52 - 67</td>
<td>70 - 89</td>
</tr>
<tr>
<td>44 and above</td>
<td>Low Risk</td>
<td>68 and above</td>
<td>90 and above</td>
</tr>
<tr>
<td><strong>RTF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>BENCHMARK GOALS FOR THIS MEASURE HAVE NOT YET BEEN ESTABLISHED.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preliminary evidence indicates that for students to be on track with comprehension they should meet both of the following criteria: 1) meet the Oral Reading Fluency benchmark goal and 2) have a retell score of at least 25% of their Oral Reading Fluency score.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>WUF</strong></td>
<td><strong>BENCHMARK GOALS FOR THIS MEASURE HAVE NOT YET BEEN ESTABLISHED.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tentatively, students in the lowest 20 percent of a school district using local norms should be considered at risk for poor language and reading outcomes, and those between the 20th percentile and 40th percentile should be considered at some risk.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Third Grade: Three Assessment Periods Per Year

<table>
<thead>
<tr>
<th>DIBELS Measure</th>
<th>Beginning of Year</th>
<th>Middle of Year</th>
<th>End of Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Months 1 - 3</td>
<td>Months 4 - 6</td>
<td>Months 7 - 10</td>
</tr>
<tr>
<td><strong>Scores</strong></td>
<td><strong>Status</strong></td>
<td><strong>Scores</strong></td>
<td><strong>Status</strong></td>
</tr>
<tr>
<td><strong>ORF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - 52</td>
<td>At Risk</td>
<td>0 - 66</td>
<td>0 - 79</td>
</tr>
<tr>
<td>53 - 76</td>
<td>Some Risk</td>
<td>67 - 91</td>
<td>80 - 109</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Preliminary Evidence for Reading Comprehension

Preliminary evidence indicates that for students to be on track with comprehension they should meet both of the following criteria: 1) meet the Oral Reading Fluency benchmark goal and 2) have a retell score of at least 25% of their Oral Reading Fluency score.

### BENCHMARK GOALS FOR THIS MEASURE HAVE NOT YET BEEN ESTABLISHED.

- **ORF**
  - Scores: 0 - 70 At Risk
  - Scores: 71 - 92 Some Risk
  - Scores: 93 and above Low Risk

- **RTF**
  - Scores: 0 - 70 At Risk
  - Scores: 71 - 92 Some Risk
  - Scores: 93 and above Low Risk

### WUF

Tentatively, students in the lowest 20 percent of a school district using local norms should be considered at risk for poor language and reading outcomes, and those between the 20th percentile and 40th percentile should be considered at some risk.

### Fourth Grade: Three Assessment Periods Per Year

<table>
<thead>
<tr>
<th>DIBELS Measure</th>
<th>Beginning of Year Months 1 - 3</th>
<th>Middle of Year Months 4 - 6</th>
<th>End of Year Months 7 - 10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORF</strong></td>
<td>Scores</td>
<td>Status</td>
<td>Scores</td>
</tr>
<tr>
<td></td>
<td>0 - 70</td>
<td>At Risk</td>
<td>0 - 82</td>
</tr>
<tr>
<td></td>
<td>71 - 92</td>
<td>Some Risk</td>
<td>83 - 104</td>
</tr>
<tr>
<td></td>
<td>93 and above</td>
<td>Low Risk</td>
<td>105 and above</td>
</tr>
</tbody>
</table>

### BENCHMARK GOALS FOR THIS MEASURE HAVE NOT YET BEEN ESTABLISHED.

Preliminary evidence indicates that for students to be on track with comprehension they should meet both of the following criteria: 1) meet the Oral Reading Fluency benchmark goal and 2) have a retell score of at least 25% of their Oral Reading Fluency score.

### NOTE:

Benchmark goals for grades 4 - 6 are estimated, and may be subject to revision based on future research. To learn more about how the goals were estimated.
### Fifth Grade: Three Assessment Periods Per Year

<table>
<thead>
<tr>
<th>DIBELS Measure</th>
<th>Beginning of Year Months 1 - 3</th>
<th>Middle of Year Months 4 - 6</th>
<th>End of Year Months 7 - 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scores</td>
<td>Status</td>
<td>Scores</td>
<td>Status</td>
</tr>
<tr>
<td><strong>ORF</strong></td>
<td>0 - 80</td>
<td>At Risk</td>
<td>0 - 93</td>
</tr>
<tr>
<td></td>
<td>81 - 103</td>
<td>Some Risk</td>
<td>94 - 114</td>
</tr>
<tr>
<td></td>
<td>104 and above</td>
<td>Low Risk</td>
<td>115 and above</td>
</tr>
<tr>
<td><strong>RTF</strong></td>
<td>BENCHMARK GOALS FOR THIS MEASURE HAVE NOT YET BEEN ESTABLISHED.</td>
<td>Preliminary evidence indicates that for students to be on track with comprehension they should meet both of the following criteria: 1) meet the Oral Reading Fluency benchmark goal and 2) have a retell score of at least 25% of their Oral Reading Fluency score.</td>
<td></td>
</tr>
<tr>
<td><strong>NOTE:</strong></td>
<td>Benchmark goals for grades 4 - 6 are estimated, and may be subject to revision based on future research. To learn more about how the goals were estimated.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Sixth Grade: Three Assessment Periods Per Year

<table>
<thead>
<tr>
<th>DIBELS Measure</th>
<th>Beginning of Year Months 1 - 3</th>
<th>Middle of Year Months 4 - 6</th>
<th>End of Year Months 7 - 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scores</td>
<td>Status</td>
<td>Scores</td>
<td>Status</td>
</tr>
<tr>
<td><strong>ORF</strong></td>
<td>0 - 82</td>
<td>At Risk</td>
<td>0 - 98</td>
</tr>
<tr>
<td></td>
<td>83 - 108</td>
<td>Some Risk</td>
<td>99 - 119</td>
</tr>
<tr>
<td></td>
<td>109 and above</td>
<td>Low Risk</td>
<td>120 and above</td>
</tr>
<tr>
<td><strong>RTF</strong></td>
<td>BENCHMARK GOALS FOR THIS MEASURE HAVE NOT YET BEEN ESTABLISHED.</td>
<td>Preliminary evidence indicates that for students to be on track with comprehension they should meet both of the following criteria: 1) meet the Oral Reading Fluency benchmark goal and 2) have a retell score of at least 25% of their Oral Reading Fluency score.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Problem Solving/Performance Feedback Meeting Checklist

Observer Training Agenda

<table>
<thead>
<tr>
<th>Step</th>
<th>Check When Step is Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observer Name:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td>Brief Review of Study</td>
<td></td>
</tr>
<tr>
<td>Requirements of observer:</td>
<td></td>
</tr>
<tr>
<td>• At least one co-observation</td>
<td></td>
</tr>
<tr>
<td>• One independent observation per teacher</td>
<td></td>
</tr>
<tr>
<td>• Two weekly feedback meetings</td>
<td></td>
</tr>
<tr>
<td>Observation Procedures:</td>
<td></td>
</tr>
<tr>
<td>• Review Intervention Scripts</td>
<td></td>
</tr>
<tr>
<td>• Review Intervention Adherence Coding</td>
<td></td>
</tr>
<tr>
<td>System</td>
<td></td>
</tr>
<tr>
<td>• Practice Scenarios</td>
<td></td>
</tr>
<tr>
<td>Ask/Answer any questions</td>
<td></td>
</tr>
<tr>
<td>Schedule Classroom Observations</td>
<td></td>
</tr>
</tbody>
</table>

________________________________________________________________________

Trainer Signature                              Observer Signature
Appendix C

Teacher/SLP Demographic Information

*Modeled From Ihlo, 2004

Directions: Please complete the following questions. Your responses will be used to summarize participant characteristics. All information collected during this project will be kept confidential.

Gender: Male or Female (Circle One)

Ethnicity: African American Caucasian Asian Hispanic Other (Circle One)

Number of years teaching: __________

Current Grade Teaching: __________

Number of years at current grade level: __________

Have you ever attended training on implementing interventions in the classroom? yes or no

Training can include college course, staff development, in-service)

Please circle your response to the following questions:

Your understanding of the RtI model

1 2 3 4 5

No Minimal I understand Average I completely

Understanding I know some terms and premise I understand understand

of the terms but couldn’t and try to and

implement in implement implement in

my class in my class in my class

Your proficiency in collaborating with other educators to address student concerns

1 2 3 4 5

I don’t think I am not sure how I like to collaborate I collaborate but not I am

collaboration to collaborate but but find it difficult as often as I would like pro-
is beneficial I would like to due to time frequent.

learn. or other constraints.
Appendix D

Visual Support Guide

- Make a prediction
- Look at Vocabulary
- Use a think aloud
- Watch out for tricky sentences
## Appendix E

### Intervention Checklist

<table>
<thead>
<tr>
<th>Intervention Step</th>
<th>Permanent Product</th>
<th>Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand out student binders</td>
<td>Presence of completed student sheets in binders at the end of the day</td>
<td></td>
</tr>
<tr>
<td>Introduce the topic for the day. Ask students to highlight title on their student sheets in their binders.</td>
<td>Title highlighted on sheets in students’ binders</td>
<td></td>
</tr>
<tr>
<td>Explain predictions to the students</td>
<td>Presence of students’ predictions on their sheets in student binders</td>
<td></td>
</tr>
<tr>
<td>Ask students to read their predictions and explain why they guessed that</td>
<td>Teacher comments on the prediction in the teacher binder</td>
<td></td>
</tr>
<tr>
<td>Explain the topic to the students</td>
<td>Check in appropriate box on sheets in teacher binder</td>
<td></td>
</tr>
<tr>
<td>Read vocabulary words</td>
<td>Check in appropriate box on sheets in teacher binder</td>
<td></td>
</tr>
<tr>
<td>Pre-teach vocabulary</td>
<td>Vocabulary sheets completed by students in students’ binders</td>
<td></td>
</tr>
<tr>
<td>Have them write the words and draw a pictures defining the words</td>
<td>Vocabulary words written and pictures drawn on sheets in students’ binders</td>
<td></td>
</tr>
<tr>
<td>Have the students practice “think aloud” after each sentence</td>
<td>Student completed “think aloud” sentences in the student binder</td>
<td></td>
</tr>
<tr>
<td>Syntax ----- practice analyzing sentences with clauses in them</td>
<td>Students completed syntax section in students’ binders</td>
<td></td>
</tr>
<tr>
<td>Give reward slips/tickets</td>
<td>Reinfocer exchange noted on the slips in teacher binder</td>
<td></td>
</tr>
</tbody>
</table>

(*adapted from Noell, Witt, Gilbertson, Rainier & Freeland, 1997)
Appendix F

Teacher Survey

Below is a brief survey. Please complete and then hand back into the SLP. Your responses will be used to gather more information for this study.

Number of your students involved in the study______________________

Please circle the number that best represents your response.

<table>
<thead>
<tr>
<th>Question</th>
<th>1=No, I don’t think it made a difference.</th>
<th>2=I am not sure because of inconsistent results</th>
<th>3= Somewhat, Approximately 50% of all opportunities</th>
<th>4=Frequently, more than 50% of all opportunities</th>
<th>5=Yes, Consistently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working with the SLP helped in the development of a reading comprehension intervention</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>I found the reading comprehension intervention helpful.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>The intervention positively affected child outcomes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>This collaboration</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>procedure benefited the child’s reading comprehension.</td>
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<td></td>
</tr>
<tr>
<td>I was satisfied with this collaborative procedure</td>
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<tr>
<td>The performance feedback meetings helped me implement the intervention.</td>
<td></td>
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</tbody>
</table>
Appendix G

Observer Codes

Intervention Adherence Coding System

Observation procedure for measuring adherence to intervention scripts

• If a step occurs, place an ‘+’ in the blank
• If a step does not occur, place a ‘-’ in the blank
• If the step does not take place because you were not there to observe it, place an ‘NO’ in the blank (For example, the student is to receive his reward but you are not there to observe him receiving it)
• If a step occurs more than once, each occurrence or nonoccurrence must be recorded.
• At the bottom of the script, note the number of applicable steps you observed and the number of steps completed. Also, write comments describing any unusual or unexpected things that occurred during your observation
• (Observation procedures adapted from Blackston, 1999)
Appendix H CBM-Maze AIRS*

If we use the standardized instructions and score correctly, different examiners should obtain about the same results. To ensure that examiners are consistent in administration and scoring, we recommend "heck outs," using the accuracy of implementation rating scale (AIRS) like the one below.

Examiner:______________________ Date:______________________

X = completed accurately O = incorrect

Distributes Maze so students_______________________

Start when appropriate____________________________

Says standardized directions_______________________

Uses necessary practice test_______________________

Says "Begin"_______________________

Starts stopwatch at correct time_______________________

Monitors for "circling"_______________________

Times accurately_______________________

Records time for prorating_______________________

Stays "Stop"_______________________

Stops stopwatch_______________________

Monitors to ensures_______________________

Collects Mazes_______________________

*modified from Shinn & Shinn, 2002
Appendix I Permanent Product

Date____________________

<table>
<thead>
<tr>
<th>Student</th>
<th>Prediction</th>
<th>Satisfactory of Acceptable</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1=on target, relevant</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=close to target</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=off topic, not close, no</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>relevance</td>
<td></td>
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<td></td>
<td></td>
<td>1 2 3</td>
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<td>1 2 3</td>
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<td>1 2 3</td>
<td></td>
</tr>
</tbody>
</table>

I discussed the topic   yes  or  no
I reviewed vocabulary words  yes  or  no
I gave reward slips to ________________________________

________________________________

________________________________
Read the title

Write the title

What is this going to be about?

My prediction is
Vocabulary Help

Clues my teacher taught me to remember the important words

<table>
<thead>
<tr>
<th>Word</th>
<th>Clue</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
Important words from the story/ text

| Word____________________ | Word____________________ | Word____________________ |
### My think alouds

<p>| | | | | | | |</p>
<table>
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<tr>
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</thead>
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<td>6</td>
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</tr>
</tbody>
</table>
Tricky Sentence

My teacher talked to me about this sentence or these sentences.