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The Effects of Explicit Instruction of Predictions and Inference Making on the Reading
Comprehension of an Elementary-School Student

By

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Abstract

This study examined how the explicit instruction of prediction and inference making skills affects overall reading comprehension. The participant was one third-grade student who was diagnosed with dyslexia. She required skills to overcome the decoding and word recognition challenges that prevented her from comprehending texts. Over the course of four weeks, the participant attended 55-minute sessions in which areas of reading comprehension, especially inference making, were assessed. She also received extensive modeling and guided practice in various comprehension strategies. Results for the study show that explicit instruction of prediction and inference making increases overall reading comprehension.

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Chapter One

Introduction

In 2011, only 34% of the country's fourth graders were at or above Proficient reading levels (National Assessment of Educational Progress [NAEP], 2011). Students struggle with reading comprehension on many levels and for different reasons. Jane Oakhill (1993) sites three reoccurring themes in reading deficits and attempts at intervention. One of the main areas researchers focus on for intervention is the single-word level. Secondly, struggling comprehenders have deficits in syntactic and semantic structures within the text. Finally, poor comprehenders have low abilities with higher-level thinking and comprehension skills (Oakhill, 1993). The National Center for Education Statistics (NCES, 2006), a division of the U.S. Department of Education, reports that the more a child is read to or reads for fun, the higher chance that child will have for becoming a good reader. However, researchers have pointed out that students who have high word recognition skills and are regularly exposed to texts are often being left out of studies (Locascio, Mahone, Eason, and Cutting, 2010). In fact, many of these seemingly good readers do not actually comprehend what they are reading when asked after they are finished.

The National Assessment of Educational Progress (NAEP, 2011) assessed several areas of reading comprehension (locate and recall, integrate and interpret, and critique and evaluate). According to the NAEP, only 64% of fourth graders were able to provide an "Acceptable" answer on the Integrate and Interpret questions and only 45% were able to provide an "Acceptable" answer for the Critique and Evaluate questions on the 2011 reading assessment. These statistics show that young children are struggling to extend their comprehension to higher-level thinking and that instruction regarding comprehension strategies are required for greater

success. A reoccurring area of higher level think that is often used on assessments is inference making.

Research suggests that adults are more successful at making inferences than young children because of their plethora of prior knowledge (Hansen and Pearson, 1980). Therefore, if young children lack enough prior knowledge, other inference making strategies must be taught to achieve accurate comprehension. In addition, researchers question if young children are capable of spontaneously making logical inferences without instruction on how to do so. Authors of short stories frequently write without including all of the facts, therefore inference making is a necessary skill to possess for comprehension (Hansen and Pearson, 1980). In addition, reading comprehension is not only a concern within literacy domains, but will carry over into many subject areas and life skills (Tompkins, Guo, and Justice, 2013). As a result, skills for reading comprehension are essential to a student's academic success. Consequently, structured interventions that employ modeling, guided practice, and feedback to teach students how to use inference making strategically and eventually automatically is imperative.

The purpose of this study was to determine the effect of explicit instruction on predictions and inference making on the reading comprehension of an elementary school student. It was hypothesized that if the explicit instruction of prediction strategies is successfully taught to elementary school readers their reading comprehension abilities, as measured by informal assessment, would increase. The study began with a parent and student survey of the school and home literacy environment. The parent survey was sent home and asked parents about the students' school progress, reading difficulties and kind of reader the student is at home. The researcher's interactions with the students began with a Motivation to Read survey and interview. The questions were read to the student so reading comprehension was not a barrier.

Finally, students completed a pretest and posttest. The QRI-5 (Leslie & Caldwell, 2006) was administered to determine the participant's reading comprehension levels prior to and after the reading intervention.

Over the course of four weeks, the student received explicit instruction on when and how to make meaningful and useful predictions while reading narrative texts. Observations were recorded based on how the student was making inferences (prior knowledge, images, etc.) and also what types of inferences they were making (emotional, action, casual, etc.). Through open-ended questions, students were trained how to articulate the inferences and the source they used to make them. The goal was to decrease guessing and minimize solely prior-knowledge-based inferences and increase the amount of context-based or image-based inferences the students are making. This change will force students to be more engaged and aware of the text rather than depending on prior knowledge, which depending on the text may not be available at times. Specifically, students will begin to make more inferences and be able to identify what strategy (prior knowledge, textual evidence, or images) they used to make each inference.

The researcher maintained student attendance records, audio recordings of interventions, and summary notes regarding each session. At the end of the four-weeks, post-tests were administered to collect data regarding growth. The parents also received feedback on the reading intervention and the effects on their students' reading abilities and comprehension. Suggestions for future interventions involving the student were provided. The structuring of the intervention was based on a variety of strategies used in previous studies related to this topic. The following chapter will summarize these studies and the data collected from each.

Chapter Two

Literature Review

Introduction

Countless studies have been completed over the past twenty-five years regarding reading comprehension and the reasons why children may be experiencing deficits. The current influx of technology and diminishing values of reading is frequently the media's common point of blame. In the education community, reading comprehension research has been focused on children's deficits in word recognition and acquisition of language. However, current research is beginning to look at the cognitive abilities of young children and analyzing the age in which higher order levels of thinking are acquired. Researchers are seeing more and more children with excellent fluency and decoding skills, yet with no ability to retell or summarize what they just read. Recent research is beginning to point to the executive functioning skills as a primary source of good comprehension, rather than solely weaknesses in basic language skills (Locascio, Mahone, Eason, and Cutting, 2012). Executive functioning skills such as organization and self-monitoring are needed for a greater understanding of texts. Documented interventions exist in which students are explicitly taught comprehension monitoring and other active reading strategies such as predicting and inference making. These interventions have proven to be effective and possibly more appropriate particularly for students moving from the learning to read into the reading to learn phases of their literacy education.

Research is now being conducted to analyze children's executive functioning skills and the relationship to their reading comprehension with higher-level thinking despite good word recognition skills (Locascio, Mahone, Eason, and Cutting, 2010). The skills needed to

successfully activate higher-level thinking require the use of metacognition. As defined by the Oxford dictionary, metacognition is “awareness and understanding of one’s own thought process” (metacognition, n.d.). A change in traditional instruction must occur if young children are to become higher-level thinkers. Currently, a teaching model of reading a text and answering multiple-choice questions is commonly overused. Instead of teaching students how to comprehend one text at a factual level, teachers need to effectively teach students strategies to independently comprehend all texts (Eilers & Pinkley, 2006). In order for students to become more independent doers and thinkers, explicit instruction and modeling of these strategies must occur.

Educators debate what types of interventions will work best to increase children’s critical thinking skills. In some studies, the debate has become a chicken or the egg discussion. Which comes first? Are cognitive skills such as inference making needed for good comprehension or is good comprehension needed first in order to perform higher order thinking such as inference making (Cain & Oakhill, 1999)? There is no question that teaching young children to be self-directed learners who actively monitor their comprehension is an effective method for increasing comprehension. The question exists though, which skills will be most effective for increasing comprehension? Interventions with mnemonic devices, explicit organizational strategies, and clear modeling from instructors in the area of inference making have created structured and successful approaches to increase reading comprehension for young children.

The goal of this action research project is to examine the effects of making predictions and inferences on the reading comprehension of elementary-school students. This chapter summarizes several studies that address critical questions pertaining to this project: What barriers exist between elementary-school student’s abilities and proficient reading comprehension? What

struggles do young readers face regarding text-types and question-types? How can metacognitive strategies improve reading comprehension? Does inference making instruction improve reading comprehension skills? How can an instructor bridge the gap between the understanding of explicit and implicit in a young reader's mind? What instructional strategies will provide a clear approach to teaching inference making? The first section of this chapter focuses on the reading comprehension difficulties that currently exist in young readers. The second section focuses on the relationship between inference making and reading comprehension. Finally, the third section focuses on the instructional strategies for increasing a young reader's ability to make predictions and inferences to improve their overall reading comprehension.

Metacognition for the Improvement of Reading Comprehension

There is a frequent misconception that if a student can decode and read fluently, then they can comprehend what they are reading. However, research and national test scores show that this is not the case for many young readers. A new wave of instruction is now encouraging teachers to teach metacognition strategies so students will read more actively and yield higher comprehension. Prior to this realization, Jane Oakhill (1993) conducted studies to look more closely at this misconception.

Children's difficulties in reading comprehension. Oakhill (1993) conducted a study to investigate specific complications that poor comprehenders experience when reading. The purpose was to create groups of good comprehenders and poor comprehenders that have matched decoding skills in order to solitarily analyze how they differ in their ability to answer comprehension questions. The researcher hypothesized that basic decoding abilities were not the sole predictors to a young child's ability to comprehend a text. The participants were selected

from classes of seven to eight years old after being assessed with the *Gates-McGinitie Vocabulary Test* (Gates and McGinitie, 1965). The students were then divided into skilled comprehenders and less-skilled comprehenders. Both groups were matched in their ability to read isolated words aloud, but differed in their ability to answer comprehension questions.

Oakhill (1993) analyzed the differences at the word, sentence, and passage level. The pretests results showed no difference between skilled and less-skilled comprehenders in decoding speed, accuracy, or automaticity so it was unlikely that comprehension differences were due to deficits at the single-word level. Each child's reading comprehension at the sentence level was assessed by using the *Test for Reception of Grammar* (Bishop, 1982), however there were no differences found between the two groups on this assessment either. Therefore, the researcher concluded that the poor comprehender's deficits were not directly related to decoding. Further analysis of the poor comprehenders showed three categories of weakness in the area of inference and text generation: inferring implicit information, connecting ideas within the text, and inferring the meaning of words within the text. The researcher suggested these as areas of focus for improvement of comprehension. Additionally, the researcher secondly hypothesized that working memory could contribute to low comprehension. Therefore, additional testing was conducted with the use of look-backs. However, the less-skilled comprehenders still struggled to answer comprehension questions. Therefore working memory was ruled out as a contributor to poorer comprehension skills.

After the data was collected, three groups of less-skilled comprehenders and three groups of skilled-comprehenders were divided to conduct training sessions. The three groups included instruction in (1) inferential skills, (2) decoding skills, and (3) a control group. The results

showed that the group of less-skilled comprehenders that were trained in inferential skills had a larger increase in reading comprehension than the control group. Additionally, the group of less-skilled comprehenders trained in decoding skills saw less improvement in reading comprehension than those trained in inferential skills. Overall, the researcher determined that there was no link between fast decoding and good comprehension and that a young child can have one skill without the other. Furthermore, the researcher concluded that instruction in inferential skills is more beneficial to comprehension than instruction in decoding. The researcher did caution that any form of comprehension monitoring should be taught alongside basic reading skills if the child has not yet mastered them.

Oakhill's (1993) work solidifies the fact that young readers need more than fast decoding skills to have good comprehension skills. Also, if a young reader is to increase their reading comprehension a focus on inferential skills is more beneficial than a focus on decoding skills. More current research (Locascio, Mahone, Eason, & Cutting, 2010) is analyzing the differences between students with specific reading comprehension deficits and word recognition deficits. Furthermore, this research is examining what executive dysfunction is taking place during their comprehension.

The study conducted by Locascio, Mahone, Eason, and Cutting (2010) examined a range of skills regarding executive function and their relationship to reading comprehension. The researchers discussed how much emphasis has been put on word recognition and fluency's effects on reading comprehension deficits and little on executive functioning skills such as working memory, planning, organization, and self-monitoring. The purpose of the study was to determine patterns of executive dysfunction that are unique to reading difficulties within three

focus groups: children with word recognition deficits (WRD), children with specific reading comprehension deficits (S-RCD), and a children progressing typically with reading. The researchers hypothesized that the WRD group would have difficulties with working memory related to their weak phonological processing and that the S-RCD group would have difficulties in strategic planning and organization. Overall, the researchers hypothesized that the WRD and S-RCD group would both experience executive dysfunction, but in different capacities.

Children ages 10-14 were targeted for this study because the researchers recognized that the shift from learning to read to reading to learn occurs after third grade. Eighty-six children participated in the study. Children were placed into the WRD group if they scored below the 25th percentile on the *Basic Skills Cluster of the Woodcock Reading Mastery Test-Revised/Normative Update* (Woodcock, 1998) which analyzed *Word Identification* and *Word Attack*. Children were placed in the S-RCD group if their average word recognition was above the 37th percentile, but scored below the 25th percentile on at least two out of five reading comprehension assessments. Prior to being accepted as participants, telephone interviews were conducted with parents in order to exclude the following groups: cognitively disabled, visually impaired, hearing impaired, children with a present neurological or psychiatric disorder, and children scoring below 80 or above 130 on a Full Scale IQ assessment. Children diagnosed with ADHD were allowed to participate due to the researchers' hypothesis that a relationship exists between reading comprehension deficits and executive dysfunction, and this group historically meets these requirements.

The process of the study consisted of many formal assessments administered over two days. Guardians of all participants completed a *Behavioral Rating Inventory of Executive Function* (Gioia, Isquith, Guy, and Kenworthy, 2000). In addition, a measure of socioeconomic

status (SES) and a full IQ scale were administered. Children from all groups participated in four tests that analyzed phonological processing, word recognition, and fluency. Five assessments were used to analyze comprehension including measures of literal and inferential comprehension, functional and recreational reading materials, reading orally and silently, and cloze exercises. Finally, eight assessments were used to analyze executive function in the areas of working memory, planning, organization, self-monitoring, and response inhibition.

Overall, the researchers found that there is an existing relationship between reading disorders and executive dysfunctions. Furthermore, the relationship between the two is not solely due to the processes of word recognition, as the S-RCD group demonstrated executive dysfunction in the areas of strategic planning. Additionally, students in the S-RCD group performed poorly on the strategic planning areas of assessment, while the WRD group did not. When analyzing the WRD group, the researchers determined that executive dysfunction could be linked to the difficulties with the phonological processes. Therefore, the researcher's hypothesis that the WRD and S-RCD groups would have executive dysfunctions in different areas is accepted. Finally, the hypothesis that the WRD group's comprehension would be related to their phonological processes and that the S-CRD group would have difficulties with planning and organization was also accepted.

In conclusion, Locascio et al. (2010) added to Oakhill's (1993) research that fast word recognition is not a predictor for good comprehension. Much instructional time is focused on having young readers increase their fluency; however more emphasis needs to be placed upon comprehending during the reading process. Eason, Goldberg, Young and Geist (2012) concur that word recognition does not adequately account for differing abilities in young reader's

comprehension. These researchers have added a more specific analysis of reading materials and comprehension demands that a young reader faces.

Approaching different text and question types. Eason, Goldberg, Young and Geist (2012) conducted a study to explore the effects of different text types and questions types on the reading comprehension of young children. The purpose of the study was (1) to determine if text or question types differ in terms of how difficult they are for children and (2) if these differences exist, is it because the variations among text and question types place demands upon different cognitive skills? The researchers hypothesized that expository texts are the most difficult passages and that the participants would have the highest level of accuracy when answering literal (not inferential) questions. The researchers also hypothesized that elements of basic language, such as semantics, would predict how a student would perform when reading any text type or answering any questions type. Lastly, the researchers hypothesized that higher level processes (i.e. inference) would only contribute to more complex text and question types.

The sample consisted of 126 young children, with and without learning disabilities, ages 10-14. Seventy-two boys and 54 girls made up the sample. Fliers, word of mouth, and advertisements were used to recruit the participants. After applying, a telephone interview was conducted for screening to exclude children with the following: cognitive disabilities, vision or hearing impairments, neurological disorders, psychiatric disorders treated with medication (although children with ADD or ADHD were allowed), and an IQ below 80 or above 130. Additionally, non-native English speakers were also excluded. Participants were required to take one of the following assessments to determine IQ and continue with the study: Verbal Comprehension Index, Perceptual Reasoning Index, or the Wechsler Intelligence Scale for Children IV (Wechsler, 2003).

During the study, each child averaged about seven hours of testing over a two-day period. Day one consisted of one-on-one testing with a psychologist and day two was used to complete any testing. First, the *Stanford Diagnostic Reading Test IV* (Carlson & Gardner, 1995) was used to measure comprehension by having students read text and answer questions. Four different question types were used: initial understanding, interpretation questions, critical analysis, and process strategies. Furthermore, the researchers distinguished three types of text: narrative, expository, and functional. Secondly, word-level measures (identification, decoding, and fluency) were assessed with the *WRMT-R/NU* (Woodcock, 1998) and *TOWRE* (Torgesen, Wagner, & Rashotte, 1999). Finally, language, inferencing, and organization were assessed with the *PPVT-III* (Dunn & Dunn, 1997), *Test of Language Development-Intermediate* (Newcomer & Hammill, 1997), *Test of Language Competence-Expanded Edition* (Wiig & Secord, 1989), and *Delis-Kaplan Executive Function System* (Delis, Kaplan, & Kramer, 2001).

The researchers found that there was no significant difference in difficulty of comprehension between narrative and expository passages. However, narrative passages required less sequential organization than expository passages. This is most likely due to the fluid structure of a narrative story. When analyzing the predictors of reading comprehension by text type and question type, the researchers found that word recognition was a significant contributor to comprehension. In addition, basic language was a prominent role across all three text types and questions types tested. These results are contrary to what Oakhill (1993) and Locascio, Mahone, Eason, and Cutting (2010) previously concluded.

When analyzing the question types, expository text required more inferencing, planning and organizational skills to accurately respond to comprehension questions. However when

analyzing narrative and functional passages, there was not a significant variance in the amount of inference making required to accurately answer comprehension questions. When the researchers analyzed question types that the participants accurately answered, there were fewer correct responses for critical analysis and process strategy questions than initial understanding and interpretation questions. These results demonstrate that young readers need more instruction in higher-level thinking skills (i.e. inferencing and organization) than in providing factual answers.

In conclusion, this article discusses the importance of reading comprehension across an array of text types and the necessary skills a student requires to answer a variety of question types. The researchers discuss the need for children to be able to comprehend all text types independently as they reach late elementary school. Simply obtaining high word recognition and language skills is a predictor of high comprehension levels, however the researchers state that it will not suffice in reading and answering more complex questions.

Reading strategy skills are required for students to access more complex text types and critical analysis questions. Therefore, young readers must be exposed to metacognition strategies as soon as possible in order to increase their abilities in reading comprehension at a young age. Changing the way teachers provide instruction for poor comprehenders can mean substantial progress for the future of reading interventions. Linda H. Eilers and Christine Pinkley conducted a study in Arkansas in 2006 that examined the effects of exposing these strategies to first graders.

Importance of metacognition. The study conducted by Eilers and Pinkley (2006) explored the use of explicit metacognitive strategies and its effects on reading comprehension. The purpose of their study was to assess the effectiveness of explicit instruction regarding

specific metacognitive strategies in the areas of prior knowledge, predicting, and sequencing on comprehension. The study specifically focused on the development of first graders reading comprehension. The researchers hypothesized that the explicit instruction of these three metacognitive strategies would improve the students overall reading comprehension.

The sample consisted of 24 first graders from one classroom. Prior to the study archival data was collected for comparisons. First, the *Beaver Development Reading Assessment* (BDR) (Beaver, 1999) was conducted two weeks prior to the test to measure current reading comprehension levels. Second, an *Index of Reading Awareness* (IRA) (Jacobs & Paris, 1987) was used to record the student's current levels of cognitive thinking about reading. Both of these tests were used as a posttest as well. After data was collected, the intervention began with explicit teaching of the metacognitive strategies.

The intervention took place in both whole group and small group and was conducted daily during reading time for nine weeks. The whole group was used to introduce strategies in a scaffolded manner in which each strategy was taught independently from one another. The explicit instruction of a strategy was followed by teacher-modeled instruction that included utilizing prior knowledge and making connections (text-to-self, text-to-text, text-to-world) by using context clues, making meaningful predictions, and sequencing the important events of a story.

Small groups were created homogeneously based on the pretest scores and their knowledge of sight words. The groups were defined as below grade level, above grade level, and on grade level. Each group consisted of two to five students with a total of six groups. In the small groups, support was provided for independent reading. During the independent reading,

students were expected to utilize graphic organizers that were explicitly modeled during the whole group instruction. These graphic organizers aided the students in completing a twenty-question multiple choice test. Students could score zero to two points per question. A score of a two expressed the highest level of reading awareness. Students were also taught and provided with prompts including explicit sentence structure for explaining their prior knowledge, predictions, and sequencing (i.e. “This is what happened... so my prediction is...”). Additionally, the researcher met with each small group for 30 minutes a week to complete a Comprehension Strategy Checklist and take anecdotal notes. The graphic organizers, multiple-choice test, checklist, and notes provided additional quantitative and qualitative data. The checklist and graphic organizers were analyzed for patterns.

The researchers found that there was a significant increase between the pretest and posttest on both the IRA (Jacobs & Paris, 1987) and BDR (Beaver, 1999) tests. Both tests showed an increase in reading comprehension in all three groups. Therefore, the authors determined that explicit instruction in metacognitive strategies is an effective method for increasing reading comprehension regardless of current levels. Additionally, teachers noted there was an increase in all types of text connections (text-to-self, text-to-text, text-to-world) across content areas within the classroom. Many teachers noticed the students continuing the use of learned strategies outside of the designated reading time.

This study demonstrates that instruction of metacognition skills, when taught successfully, can be used to increase comprehension. The researchers used valuable tools such as the comprehension checklist in harmonization with a scaffold of each strategy. This made for a smooth transition when blending numerous strategies for increased comprehension. One aspect of metacognition is comprehension monitoring (Kolić-Vehovec & Bajšanski, 2006).

Comprehension monitoring can help direct a reader's mental process as they read, so that when they are finished reading they have better recall of what they just read. Kolić-Vehovec and Bajšanski take a different approach from previous studies, as they analyze differing comprehension at various ages.

Effects of metacognition on reading comprehension. The study conducted by Kolić-Vehovec and Bajšanski (2006) explored comprehension monitoring and the perceived use of reading strategies as influences of reading comprehension in elementary-school students. The purpose of this study was to explore (1) how students perceive their abilities in utilizing reading strategies and comprehending text, (2) the effects of this perceived use, and (3) comprehension monitoring as a predictor of reading comprehension in elementary-school students. The researchers hypothesized that as the participant's age and grade level increased, so would their usage of reading strategies and comprehension monitoring, and in return their reading comprehension.

The sample consisted of elementary-school students, ages 11-14, from fifth to eighth grade in Rijeka, Croatia. The representation from each grade is as follows: 122 5th graders (57 girls, 55 boys), 145 6th graders (75 girls, 70 boys), 129 7th graders (69 girls, 60 boys), and 130 8th graders (73 girls, 57 boys). The participant's reading comprehension was assessed with a 750-word narrative passage suited for a higher-elementary reading level. Children of each grade level read the same passage and then were asked 11 open-ended questions. Each question could receive two possible points for a most-correct answer, with a max score of 22 points. To measure student's comprehension monitoring skills during reading, a *Metacomprehension Test* (Pazzaglia, 1994) and cloze-tasks were used. Finally, the *Strategic Reading Questionnaire* (Kolić-Vehovec and Bajšanski, 2001) was used to measure the student's perceived use of

strategies during their reading. The three subscales of this questionnaire were comprehension monitoring, active comprehension strategies, and inference generation. Each of the tests and surveys were administered during one school hour.

The results of the assessments suggested that as grade level increases, so do abilities in comprehension monitoring. The researchers pointed to a significant increase after fifth grade, but with additional transition points through eighth grade as well. The researchers also suggested that as students reach secondary school, many of these strategies and processes become more automatic. Furthermore, although there were differences in active comprehension and comprehension monitoring from grade to grade, there was no significant difference across grade levels regarding inference generation. The researchers hypothesized that this is because inference generation is complex and more controlled, therefore it does not become automatic until after eighth grade. This suggests that instruction in inference making starting at an early age and continuing throughout primary and secondary school is important. The researchers also found that both gender and grade were significant predictors for reading comprehension. Females out-performed males on all assessments. In addition, all three measures of comprehension (comprehension monitoring, active comprehension strategies, and inference generation) were significant predictors of the student's ability to comprehend the text. When analyzing the reading questionnaire, it was found that the student's perceptions of their reading abilities did not correlate with their actual abilities. The researchers hypothesized that this is because students from younger grades were not making accurate predictions of their abilities. Further correlations exemplified that across the board comprehension monitoring had a direct effect on the participants reading comprehension.

In conclusion, comprehension monitoring can be used for generating inferences during the reading of a text. When a student is reading they can ask questions like “What do I think will happen next,” and then “I think this will happen because...” However, after much instruction and practice, the student will begin to internalize these strategies and these questions will become automatic. Although they may not become automatic until secondary school, continual practice and exposure throughout elementary school will have a positive effect on a student’s comprehension monitoring and in return their reading comprehension.

The studies conducted by Oakhill (1993), Locascio, Mhone, Eason, & Cutting (2010), and Eason, Goldberg, Young, and Geist (2012) all concur that word recognition, decoding, and fluency are not the sole predictors of reading comprehension. Furthermore, these studies reveal that an emphasis on metacognition instruction can make young readers not only better comprehenders, but more independent readers. The research of Locascio et al. (2010) more explicitly states that increasing executive functioning, for example planning and organization is a key component to remediation of reading comprehension skills. Planning and organization includes the ability to make predictions, monitor reading, sequence and retell a text, and drawing conclusions. Of these skills, much of the research points to the power of teaching inference making skills.

The Relationship between Inference Making and Reading Comprehension

In order to increase reading comprehension, young readers should be making predictions and inferences before, during, and after reading. This may include analyzing illustrations, discussing a prediction before a page turn, generating an inference about a character, their actions, or a cause and effect situation. Research has shown that young readers generally answer

literal comprehension question with minimal difficulty. However, when confronted with an inferential comprehension question, young readers struggle not only to answer the question, but to even begin processing how to approach these types of questions (Kolić-Vehovec & Bajšanski, 2006). This demonstrates that more explicit instruction of inference making is needed for young readers to increase their overall comprehension skills. In order to fully understand the benefits of inference making, it is first important to analyze what is happening when a young reader struggles to make an inference when reading.

Inference making challenges and comprehension deficits. A study conducted by Cain and Oakhill (1999) investigated the relationship between inferential skills and reading comprehension failure in young children. Previous studies by Oakhill (1982, 1984) pointed to a positive correlation between low reading comprehension and the inability to make inferences. Essentially these studies prompted a “which came first” discussion. Therefore, the purpose of this study was to determine if inference-making is a byproduct of good comprehension, or are children that can make inferences by nature simply better comprehenders? The researchers hypothesized that poor inference-making skills could cause poor comprehension in children. The study also explored the reasons why children fail to make these common types of inferences. It was hypothesized that three factors could contribute to the failure of making inferences: lack of general knowledge, the strength of their memory, and finally their inability to determine when to make the inferences. The use of books in similar length (between 137-150 words) for testing was determined to be the independent variable. Dependent variables included age, verbal ability, and reading ability.

In order to analyze these questions further, 80 children age six to eight were selected to participate in this study. The sample included 80 students that were chosen from a larger

population in the following manner. Six classes of seven and eight year olds were tested with the *Gates-McGinitie Primary Two Vocabulary Test* (Gates & McGinitie, 1965) to exclude exceptional readers. The determined average readers then took the *Neale Analysis of Reading Ability – Revised British Edition* (Neale, 1989). After this assessment, 29 students who were defined as less-skilled readers were determined as participants for the study. Finally, two samples from the original group were chosen to represent two more groups: the skilled comprehenders and comprehension-age matched (CAM). This process created a sample made up three different groups to be examined and compared with one another.

To conduct the research the children were tested individually. The children first began by reading a story aloud. They were then asked a set of comprehension questions in sequential order. If a child had an incorrect answer, they were asked to look back to the text to find the answer. If the child still was unable to find the answer they were guided to the area in which the answer could be found. If the child still did not know the answer, the relevant information was read aloud to the student and the original comprehension question was then repeated. These questions were broken down into three types: literal information, text-connecting inferences, and gap-filling inferences.

The researchers found that in both text-connecting and gap-filling questions the less-skilled comprehenders performed below both the skilled comprehenders and CAM group. In addition, performance for all question types improved for all children when they were given the ability to look back at the text, but were not explicitly directed. Therefore, the study concluded that memory was not a contributing factor for the failure of inference making with less skilled comprehenders. However, prior knowledge and ability to make inferences were contributors. The study demonstrated that with increased guidance and directing children to the relevant areas

of the text can allow less skilled comprehenders to make inferences. In conclusion, the researchers determined that when a child's ability to make inferences is poor, so is their ability to comprehend a text.

Although providing young readers with prompts to locate information to make inferences increased their ability to do so, it is not a guaranteed approach to increasing comprehension. Tompkins, Guo, and Justice (2012) reported that when a child is unable to comprehend a story or expository text, they struggle in many literacy encounters throughout their life. Reading comprehension and inference making are skills that extend outside of an English or language arts lesson and into everyday life. True reading comprehension involves many skills coexisting for success. In order to determine a successful approach to instruct these skills, further exploration of how young children generate inferences is needed. In order to analyze inference making skills, isolating the skills of vocabulary and decoding can present a clearer picture.

The study conducted by Tompkins et al. (2012) examined the relationship between generating inferences and overall story comprehension. The purpose of this study was to examine (1) what would online inferences look like for children ages four-five years old, (2) would children's inference generation be related to their overall story comprehension, and (3) would inferences generated while reading a wordless book predict their comprehension? The researcher's hypothesis was that the children's abilities with inferences would be significantly related to their story comprehension in all three-focus areas. The researchers further hypothesized that this relationship would go beyond the constraints of their vocabulary skills. The participants in the study were 42 children from central Florida. The 20 males and 22 females' ages ranged from 46 months to 70 months.

In order to examine any effects of the children's current vocabulary skills both a receptive vocabulary assessment, the *Peabody Picture Vocabulary Test 4th Edition* (Dunn & Dunn, 2007) and an expressive vocabulary assessment, the *Expressive Vocabulary Test 2nd Edition* (Williams, 2006) was conducted. Next, the children were tested for story comprehension based on an assessment procedure from Paris and Paris (2003). For this assessment, the participants read an online story called *Sergio Makes a Splash* (Rodriguez, 2008). Due to the online nature, rather than being read to, the participants were able to work at their own pace with less time demands. During the reading, they were stopped at seven points throughout the story to answer questions and also asked three questions after the story was finished. Overall there were five literal and five inferential questions asked. The inference questions were anything that was not directly stated in the text. The children were given a score from 0-20 receiving a rating of 0-2 for each question asked. A zero was given to an incorrect or non-response, a one was given if they simply described a picture, and a two was awarded if they integrated information across pictures or pages. The last assessment administered was story generation. A wordless book, *Frog Goes to Dinner* (Mayer, 1992), was presented to the child. The researchers determined that this prevented decoding constraints from interfering with the assessment. Mostly open-ended prompts were asked as the child explained the narrative of the story. An audio recording was used to analyze the responses. The same 0-20 point scale was used for this assessment. Inference generation was based on a researcher-created narrative that only included literal information provided by the images (i.e. the frog pulled out his pocket, not the frog had no money). As previously generated by Kendeou and McGuiness (as cited in Tompkins et al. 2012), inference codes were used with predetermined themes such as: goals, actions, causal dialogue, character emotions, place and objects.

Tompkins et al. found that (1) more character dialogue and emotion inferences were generated than goal and character action inferences. In addition, very few causal relation and antecedent inferences were made. The researchers also found that (2) inference generation and story comprehension are significantly correlated (particularly with goal, action, and character state inferences). Finally they found that (3) receptive vocabulary was not a significant predictor to overall story comprehension; however expressive vocabulary was a significant predictor to overall comprehension.

Coding to determine which inferences are more commonly used is a useful approach to analyzing a young reader's abilities and areas of difficulty. This strategy helps to consider approaches for assisting students in making inferences with the some of the more challenging capacities. Additionally analyzing the constraints of vocabulary aids in the argument that inference making capabilities can help improve comprehension when struggling readers (decoders) are considered. Once interventionists have a strong analysis of why inference making is so challenging for young readers, they can begin teach strategies that can improve comprehension. In addition, analyzing approaches that special educators have used can be beneficial to working with all students with reading deficits.

Generating inferences for improved comprehension. Fritschmann, Deshler, and Schumaker, (2007) conducted a study to determine the effects of teaching secondary students with disabilities a structured strategy for answering inferential questions. The purpose of this study was to develop and test an instructional program that would teach students with disabilities inference strategies. The researchers assessed the student's knowledge of the strategy, use of the strategy while reading narrative passages, and ability to answer inferential and literal questions. In addition the researchers used a standardized test to measure reading comprehension, a

questionnaire to measure student's satisfaction, and finally the amount of time required to teach the strategy.

The sample included eight ninth-graders with disabilities in an urban mid-west city with a population of approximately 124,000. All of the students were enrolled in learning support for English and language arts. An assessment, the *Group Reading Assessment and Diagnostic Evaluation* (GRADE) (Williams, 2001), was used to determine that all students were at least five grade levels below their current grade placement. Of the eight students, seven were diagnosed with a learning disability, and one was diagnosed with a cognitive disability. Additionally, all students received at least 180 minutes in a special education setting daily. The eight students were divided into two groups of four to receive small-group instruction.

Prior to the intervention, all eight students completed several pretests, including a researcher-created test and survey. Each student completed a Strategy Knowledge Test to determine what prior knowledge they had regarding the strategies of inference making, and a Student Satisfaction Survey to determine their attitudes towards reading and using reading strategies. Students then took the GRADE (Williams, 2001) standardized reading test. After the standardized reading test, each student participated in a probe test created by the researchers. This included three 400-word passages at the ninth-grade reading level. The researchers chose to use this grade level, because it is where the students were expected to perform if they were in the regular education environment. After silently reading the passage, the participants were required to answer five multiple choice questions. Of the five questions, one was factual and four were inferential. Each of the inferential questions focused on the question areas of the instructional program: purpose, main idea/summarizing, predicting, and clarifying. These probe tests were used as baseline data prior to the intervention.

The intervention was administered by the researchers as classroom instructors. In order to ensure best practices and fidelity, a teacher checklist was created to remind the instructor to provide organizers, discuss purpose, provide rationale and expectations, and to explicitly describe, model, and provide practice with feedback for each of the strategies. An instructional protocol with a script was also used so both groups would receive the same instruction. The participants received approximately five hours of direct instruction with an additional 15 hours of supported practice. The strategy included a mnemonic device with the word “INFER:” Interact with the text, Note what you know, Find the clues, Explore more details, and Return to the question. These steps were used to navigate narrative texts in order to answer a variety of inferential questions. The participants began practicing with short paragraphs and graduated into narrative passages ranging from fourth to eighth grade levels. Students were required to demonstrate mastery (80% accuracy) before moving up in grade level or instructional step. A gradual release was also used during instruction so that students became more independent.

At the end of the intervention, the GRADE (Williams, 2001), Student Satisfaction Survey, Strategy Knowledge Test, along with three passages each with five multiple choice questions were administered as posttests. The results of the GRADE (Williams, 2001) indicated that the students made an average of a 2.8 grade level gain. The results of the Student Satisfaction Survey suggested that the participants had a more positive attitude regarding their reading skills and comprehension processes. The results of the Strategy Knowledge Test revealed an increase from 0% for all students to an average of 91.75%. Finally, the instruction of the Inference Strategy intervention showed that the participants were able to answer more inference-type questions. In addition, a maintenance test was administered after the summer and again twelve months after the instruction. The results of the maintenance tests suggested that

students with disabilities require continued and ongoing instruction in reading comprehension strategies in order to retain the level of performance.

This discourse of this research includes the new transition of teaching and assessing higher-order thinking skills, such as inference making, rather than the skills needed to answer literal reading comprehension questions. This movement requires reading instructors to implement strategies with their students and explicitly teach, model, and provide supported practice in order for students to be successful with these new demands. In addition, these skills will cross over into other subject areas and other aspects of student's lives making them stronger critical thinkers. In order to move young readers into this new way of thinking and comprehending, instructors must clearly define explicit and implicit.

Defining explicit and implicit. Yeh, McTigue, and Joshi (2012) conducted a study to explore an intervention program and its effects on a sixth-grade student during a one-on-one tutoring session. The purpose of the study was to provide explicit instruction of inferential comprehension and then examine the potential for the intervention to increase the student's overall reading comprehension. The researchers hypothesized that if the intervention was delivered successfully it would increase the student's ability to make inferences and in return increase his overall reading comprehension. For this study, only one participant was used. Steve (pseudonym) was a sixth grader whose parents referred him to a tutor because he was having difficulties with reading comprehension. Considering Steve was a fluent reader with an exceptional vocabulary, the researchers conducted extensive pretests to determine what instruction would benefit him most.

The researchers administered the *Qualitative Reading Inventory* (QRI-4) (Leslie & Caldwell, 2006), the *Woodcock Language Proficiency Battery-Revised* (Woodcock & Johnson, 1990), the *Test of Language Development-Intermediate* (Hammill & Newcomer, 1997), the *Words their Way-Intermediate Spelling Inventory* (Bear, Invernizzi, Templeton, & Johnston, 2004) and had him completed an open-ended writing sample. The researchers used the data collected from these assessments to design and implement a tutoring program best to suit Steve's needs. The research team decided that Steve would best benefit from instruction that would help increase his inferential-thinking skills. Therefore the twelve lessons included word analogy, short riddles, mystery stories, and think-alouds with modeling.

The researchers chose to start at the basic word-level step of making inferences by having Steve complete word analogies. Steve was first exposed to synonym and antonym word analogies, but then worked towards cause and effect and purpose analogies. Once he felt confident with analogies, his tutor had him complete riddles. The riddles provided Steve with abstract ideas that quickly frustrated him. The tutor allowed Steve to create his own riddle about a self-interest topic (football) and Steve quickly advanced in his ability to solve riddles. The next step in his inferential training was to read short mystery stories. These stories provided opportunities for Steve to draw inferences, make predictions, and then check to see if they were correct. This scaffolding allowed Steve to grow and learn at an appropriate pace and for him to build simple word-level inferences into phrases and then to entire stories. The final element of Steve's intervention was the use of think-alouds. During think-alouds Steve's tutor asked Steve to produce evidence to support his ideas, examine illustrations for aide in comprehension, make summaries at several points during a text, and to focus on the sequence of events rather than the

small details. The combination of this scaffold with think alouds proved to be a successful intervention.

The results of Steve's QRI-4 posttest revealed that Steve was able to answer explicit questions with 100% accuracy and implicit questions with 88% accuracy. On his pretest, Steve was only able to answer 30% of the implicit questions correctly. Steve's mother also reported an increase in Steve's confidence and interest in reading. Additionally, she reported evident progress at school. Overall this study offers a successful scaffold for increasing a student's inferential skills. It also reinforces that inference-making to increase comprehension is a teachable skill that students can benefit from when it is taught in a logical and supported manner.

In conclusion, both Cain and Oakhill's (1999) and Tomkins et al. (2012) studies found a significant correlation between a young reader's ability to make inferences and their ability to comprehend a text. Each study removed potential secondary factors in order to focus on found contributing factors. Cain and Oakhill (1999) ruled out memory as a predictor of inference making capabilities. The latter study ruled out receptive vocabulary as a predictor of inference making capabilities (Tomkins, Guo, and Justice 2012). Cain and Oakhill (1999) also found that young children who were able to make basic inferences about a character and their actions were in return able to better comprehend a narrative story and furthermore make broader inferences about goals connections in the story. This information supports a scaffold approach in teaching basic to more complex inference making. Both small-group tutoring sessions used by Fritschmann, et al. (2007) and Yeh, et al. (2012) exemplified success with scaffolded instruction. Whether it is the use of a pneumonic device (Fritschmann, Deshler, and Schumaker, 2007) or moving from word-level to sentence-level inferences (Yeh, McTigue, and Joshi, 2012) both studies implemented a clearly modeled and practiced intervention.

Strategies to Teach Inference Making to Improve Comprehension

Many prescribed frameworks exist for teaching inference making. Across most studies and interventions similar processes are used. It is clear that in order for a student to learn comprehension strategies extensive modeling and supported practice must occur. In addition, a young reader is more likely to remember these strategies if they are taught during the process of reading rather than in isolation (Scharlach, 2008). Currently the instructional model of simply requiring readers to find factual information from the text is overused. Forcing students to think more critically by offering more opportunities to answer inferential questions during discussion can improve a reader's ability to do so independently (Hansen & Pearson, 1980). For an instructor to be most effective, it is suggested that specific and focused feedback be used to aide a young reader in influencing their areas of improvement (Thornley, Selbie, & McDonald, 2011). Finally, if a student is to be successful in future settings (i.e. state-wide assessments or content-based literacy assignments) independent practice with a gradual release approach is necessary (Scharlach, 2008).

Increasing inferential questioning. The study conducted by Hansen and Pearson (1980) explored the possibility of improving children's abilities of making inferences through inferential instruction and techniques. The researchers hypothesized that (1) techniques that help students make connections between prior knowledge and text information will increase their likelihood to draw inferences spontaneously, (2) providing more opportunities to practice answering inferential questions would enhance a child's ability to do so, and (3) students trained in inference making would understand the explicit messages in texts better.

The sample consisted of 24 second graders attending one elementary school in a middle-class suburb of St. Paul, Minnesota. In order to participate, the children needed to be all reading

at the same instructional level and all reading at grade level or above. The students were selected through teacher judgments and assessments conducted by the school's reading specialist. The 24 students were broken up into three instructional groups: Strategy, Question, and the Control. The Strategy group's focus was integrating text and prior knowledge to reading comprehension questions. The Questions group's instructor focused on regularly asking inferential questions. Finally, the Control group focused on a traditional mix of comprehension questions including a 4:1 ratio of literal to inferential questions. The groups met daily with one researcher acting as the instructor. A total of ten stories were taught over 40 days, focusing on each story for four consecutive days.

On the first day of instruction, all groups participated in identical vocabulary instruction related to the upcoming story. On the second day, all groups had an introduction to the story in which they focused on weaving new and old information. The Strategy group used a piece of gray paper with three slits to represent their brain. Each student was then given three pieces of bright-colored paper to represent new knowledge in the form of the story's main ideas. Students first activated prior knowledge and then made hypotheses about the story. They made comments orally, then recorded the information on the strips and wove them into their "brain" (the gray sheet). For the Question and Control group standard pre-reading strategies from teacher's manual were followed on this day. On the third day, the groups all participated in a guided reading of the selected story. The Strategy and Control group participated with the standard 4:1 ratio of literal and inferential comprehension questions. The Question group was given all of the same inferential questions from the other two groups, however all of their literal questions were refigured into an inferential wording. On the fourth day, skill and phonic activities from the school's curriculum were administered in all three groups.

Prior to the intervention, each student took a pretest by reading two stories and answering twenty questions. During this pretest no significant difference was found between students in the three groups. Of the ten instructional stories read, the last five were analyzed via the ten-question worksheet. Of the ten questions, two were explicit, two were inferential, two were using strategies, and four were parallel. The parallel questions included information from discussions previously had in class. During the posttest each student read two expository texts silently. One of the texts was determined to be more familiar, and both texts were an end-of-first-grade level with approximately 250 words. All twenty responses to comprehension questions were answered orally. Ten of the twenty questions were inferential that required prior knowledge. A five point scale (0-4) was used to score each of the inferential answers. In addition, a retelling of a short text was used as a posttest. A pre-established template was used to score the retelling and analyze the student's form of recall. Finally, the *Reading Test of the Stanford Achievement Test* (Pearson) was administered at the end of the intervention.

The analysis of the inferential questions asked during reading of the stories revealed no significant difference between the Strategy and Question groups during the posttest. However, both instructional groups exceeded the Control group. Both the Strategy and Question group exemplified greater comprehension even on the scoring of the literal questions. Therefore the strategies increase comprehension for both inferential and literal questioning. Where there were some differences between the Strategy and Question group, the Strategy group performed slightly higher. When familiar topics were assessed, the Question group outperformed the Control group, but not the Strategy group. During the Free Recall (retelling) assessment, there was no significant effect of the protocols on all three groups, therefore the researchers concluded that instruction did not facilitate retelling. Finally, when assessed on the *Reading Test of the*

Stanford Achievement Test (Pearson), the Question group's performance exceeded that of the two other groups.

In conclusion, the researchers determined that when analyzing the first hypothesis (techniques that help students make connections between prior knowledge and text information will increase their likelihood to draw inferences spontaneously) the Strategy group performed better than the Control group on every evaluation regarding inferential measures. The researchers also determined that when analyzing the second hypothesis (providing more opportunities to practice answering inferential questions would enhance a child's ability to do so) the Question group performed at a higher level than the Control group when drawing inferences. Finally, when analyzing the third hypothesis (students trained in inference making would understand the explicit messages in texts better), the researchers concluded when analyzing the literal questions from the stories, both the Strategy and Question group performed better than the Control group.

In order for this intervention to be successful, the students were trained to make their memory interact with the text. Therefore, prior knowledge cannot produce an inference independently; skills must be taught to young children. In addition, the researchers stated that compared to adults, children have a limited storage of prior knowledge. In conclusion, children's limited memory prevents them from spontaneously make inferences like adults. Consequently, educators must increase exposure and opportunities to answer inferential questions. While providing these opportunities, the responses the teacher has to the students trying these new skills is crucial. As the teacher or interventionist provides supported guidance, they must be very specific with their feedback.

Focused feedback and explicit explanations. Thornley, Selbie, and McDonald (2011) conducted a study to explore the effects of focused feedback on inference making instruction when reading expository text. Based on previous research done by Harvey and Goudivis (as cited by Thornley et al. 2011) in the area of inference making, inference is the bedrock of comprehension, but students who struggle with comprehension rarely make inferences while reading. The purpose of the study was to analyze the effect of focused feedback, rather than non-specific responses to students, during inference making instruction. The researchers collected their data through observations, oral surveys, and an inference assessment. Seven third grade students participated in the study. This included three girls and four boys who the teacher identified as having a difficult time with comprehension while reading expository texts. The school's population was described as midrange socioeconomic. The study was conducted over an eight month period.

Beginning with observations of the teacher's current instructional style, the researcher discovered that most of the teacher's feedback was nonspecific. Several prompts were provided and placed on visible cards to encourage the teacher's responses to be more specific and to extract further information. (i.e. "I see you got that information from this picture"). The second step was to introduce explicit instruction on making inferences within expository text. For the first four months, the teacher taught and modeled how to provide textual evidence when retelling a story. She explained to the student's that authors provide information through inferences and she clearly defined "literal" and "inferential." Furthermore, she explained that literal information is the clues to make inferences. After the first four months, the teacher noticed that student's retelling included much more textual evidence rather than speculation. However, students were still not making many inferences. Students created charts with three columns: "literal",

“inferred”, and “maybe.” The “maybe” column was used to place any information in which they were unsure about. The students used these charts as they read and set a goal of adding more information to the inferred column.

After seven months, each student participated in an oral survey. Students were asked to explain literal and inferred information and articulate why it is important to differentiate between the two. Students provided vague responses that were inconsistent. Nevertheless, at the end of the eighth month an inference assessment was administered (No pretest was administered). The assessment simply required the students to read the text and then retell all that they remembered. The text used during the assessment was about a topic that had not been discussed in class. The results showed that although students struggled to articulate explicit information about defining inferences, all seven students were now capable of making inferences while reading an expository text. Out of the seven students, three found more inferential than literal information during the final assessment. Overall the teacher considered three key components to the interventions success: use of focused feedback, a clear and explicit explanation of inferences and the purpose of making inferences, and the use of an oral survey.

Using focused feedback allows students to have a clear understanding of the ways in which they can improve. Rather than saying what a student did incorrectly, a successful interventionist should also explain how the student can correctly complete a prompt. When a young reader is continuously prompted with the correct way to make an inference explicitly, they will eventually be able to do so independently. This is just one of the many ways to make young readers more metacognitive and in turn a self-directed learner. It is important that interventionists have the end in mind. An intervention is only successful if the participant can complete the skills independently.

Self-directed learning and gradual release. A study conducted by Glaubman and Glaubman (1997) explored the effects of children's level of questioning. The purpose of the study was to analyze the effects of different theory-based intervention models and their impact on student's level of questioning. The researchers also analyzed how this relates to their comprehension of stories. The researchers hypothesized that the theory-based intervention model of instruction would increase the achievements in the student's level of questioning, story comprehension, and self-directed learning greater than a traditional model of instruction. In addition the researchers hypothesized that a metacognitive method would yield greater results than the active processing training method. Finally they hypothesized that there would be long term effects to these methods. The researchers highlight the fact that there have been many similar studies done on secondary students, but no research has yet been done on primary grade students. The participants in this study were made up of students from seven different kindergarten classes in a medium-sized (population 80,000) town in Israel. Although the initial sample was 93 students, due to movement in the classes 35 students participated in the study. All of the participants were native Hebrew speakers of medium socioeconomic status families with an average age of 5.4.

In order to collect pre-intervention data an active (hamster in a cage) and static (African statue) stimuli were placed before the students. The questions the students asked were then recorded. The questions were grouped into four levels: lowest, med-low, med-high, and highest. Student's comprehension levels were then recorded by the reading of a text with three subtests: comprehension, pictorial reconstruction, and retelling. After the pretests were complete, the students' classroom school teachers implemented an intervention program in which students were trained for question generation. The students and teachers were divided into three groups: a

control group in which typical kindergarten strategies were taught, a group in which the active processing theory was taught, and a group in which the metacognitive theory was taught. All student groups received seven and a half hours of training over a four month period. Then a posttest identical to the pretest was administered. In addition, a maintenance posttest was administered after summer vacation to test for long term effects.

Overall the researchers found that children as young as kindergarteners are very capable of using metacognitive thinking and generating higher-level questions. In the area of level of questioning, the scores of the metacognitive theory group were significantly higher than both the active process training and control group. This showed a significant difference in using the metacognitive method in creating both short and long term effects. In the area of story comprehension, the metacognitive method group's scores were significantly higher than both groups again. In the area of self-directed learning, the metacognitive group performed higher than the APT and control group which performed commensurately.

This study shows that by using a metacognitive approach, children are more likely to retain knowledge and become more self-directed learners. Teaching children to actively question what they are reading increases engagement with the text. For example, if an instructor can train a student to ask themselves, "What do I think will happen next?" they are more likely to start making inferences automatically. Studies have shown that this type of questioning and self-direction leads to higher reading comprehension. A study by Tabatha Dobson Scharlach (2008) specifically looked at two groups of students receiving reading comprehension instruction, however only one group focused on more self-directed active reading instruction.

The study conducted by Scharlach (2008) determined the effectiveness of an instructional framework that was designed to increase the use of metacognitive reading comprehension strategies. The primary approach was to model and scaffold the strategies until the students applied them independently. The researcher hypothesized that the students in the START (Students and Teachers Actively Reading Text) group would have significantly higher reading comprehension scores on the posttest after the intervention. Furthermore the researcher hypothesized that the START group would perform better than the other two groups (control and ST) on the posttest. The participants consisted of five third-grade classrooms including five teachers and 81 students. The participants were broken into three groups. The control group participated in typical read-aloud and silent reading strategies. The “ST” group participated in whole-group strategies and finally the “START” group used the metacognitive strategies in both whole-group and independent (self-directed) reading time.

Prior to the intervention, each student was given the *Gates-MacGinitie Reading Comprehension Assessment* (2004) and took a reading interest survey. The program was taught in 42 minute sessions over the course of five months. It focused on eight areas of reading metacognition: predicting/infering, visualizing, making connections, questioning, determining main idea, summarizing, checking predictions, and making judgments. These eight areas were explicitly taught by the teacher modeling each strategy to the students. Furthermore, the classroom displayed a chart with prompts for students to use when responding to questions. Each area was taught individually in a scaffold during the first eight read-aloud sessions. By the ninth session the teacher conducted read-alouds while modeling all eight strategies. After the tenth session, students began to participate in the “ART of Comprehension” during independent reading. This included monitor recording sheets that each student completed. After the five-

month intervention all three groups received the *Gates-MacGinire Reading Comprehension Assessment* (2004) as a posttest.

The authors found that the students in the START group made significantly higher gains than both the ST and control group. It was also found that there was no significant difference between the ST and control group. These findings support the hypothesis that students using the “ART of Reading” program are benefiting from the intervention. In other words students must practice metacognitive reading strategies independently for there to be comprehension gains. Students that were on grade level had a nine-month comprehension gain and a 6 percentile increase. Students that were below grade level saw an average of a six-month comprehension gain. Many of the students in the control group actually performed worse on the posttest than on the pretest. Additionally, students took a posttest reading interest survey. This survey showed that students in the START group had improved feelings and attitudes about reading.

This study offers positive insight into using metacognitive comprehension strategies. It encourages interventionists to not only encourage students make inferences and predictions, but to check and analyze them after reading. Furthermore, students need to practice using these strategies independently with support. The study also reinforced the use of a reading survey through a scaffold and with explicit instruction prior to self-directed practice. Finally, this study discussed the importance of gradual release method so students can be successful after modeling and explicit instruction. This is very important so students can use the metacognition skills when reading independently, without the help of an interventionist, and hopefully in other aspects of their learning processes.

Conclusion

Although many young readers face challenges in reading comprehension, extensive research shows that there are instructional strategies to help overcome these challenges. Studies (Eason et al., 2012) show that different text and question types can provide various challenges to young readers. Instructors must be aware of the varying challenges that expository versus narrative texts or inferential versus literal questions may present. As soon as possible, reading instructors should teach their students to become metacognitive to approach these challenges with insight. Providing young readers with the awareness of their thinking processes during reading produces positive results. Several studies (Oakhill, 1993; Locascio et al. 2010) demonstrate that interventions rooted in inference making, rather than repetitive decoding instruction, has greater success for increasing comprehension

Teaching young readers to make inferences before, during, and after reading can increase their reading comprehension. Inference making skills, along with all comprehension monitoring skills, will improve the level of comprehension the reader exhibits at the end of a text. Although some studies (Kolić-Vehovec & Bajšanski, 2006) show that higher-level thinking skills, like making inferences, do not become automatic until secondary school, it is important for elementary-school students to be provided with as many opportunities as possible. In addition, in order for instruction to be successful, teachers must provide explicit descriptions of literal and inferential information. When students then begin to practice placing textual evidence into the categories of literal or inferred, it is important that instructors provide focused feedback, rather than basic “correct” or “incorrect” responses. This feedback will help direct the reader to a higher likelihood of success in their upcoming attempts. In addition to focused feedback, all skills taught should be delivered in a scaffold. Providing one skill at a time followed by guided practice will allow the young reader to become a more independent, self-directed learner.

Therefore, the end goal for any interventionist should be to no longer be needed, because the reader now comprehends independently.

Chapter III

Procedures for the Study

The definitive goal of reading instruction is for students to be able to interact with and comprehend a text that they are reading. However, reading comprehension is not a skill that occurs at the completion of a text; instead, it is an ongoing and evolving process. Countless studies have suggested focus areas for improving comprehension and recent studies demonstrate that effective reading comprehension instruction includes inference making skills. Students who are able to make predictions before they read, and inferences as they read, have a higher likelihood of comprehending the text at its conclusion. National standardized tests have recently demonstrated low reading comprehension as a common occurrence in elementary school students. Therefore, this action research project focused on increasing reading comprehension through the explicit instruction of making predictions and inferences while reading.

The purpose of this study was to determine the effects of instruction regarding prediction and inference making on overall reading comprehension. Data were collected to explore the effects of inference making instruction on reading comprehension. This chapter will cover a description of the participant, instruments used, instructional procedures and data collection.

Description of Participant

The data were collected at Cardinal Stritch University's Science Literacy Instructional Summer Program. Participation in the program was voluntary per parent request. Eighteen

students from grades third through sixth were selected. Based on their reading levels, they were divided into two groups: Learning-to-Read and Reading-to-Learn. The current study included one Learning-to-Read student in a one-on-one instructional setting. The participant received 55 minutes of instruction four days a week for four weeks. Two days at the start and end of the intervention were used for pre and post testing.

The participant in the study, Carol (pseudonym), was a nine-year-old female with a high interest in reading and attending school. She was a rising third grader at a suburban elementary school and she economically qualified for their free lunch program. Prior to entering the reading program at Cardinal Stritch University, Carol participated in the Fauntas and Pinnell Benchmark Assessment System at her elementary school. Although Carol participated in some exploratory testing at school, she had not been identified as a child with special needs. The proctor of the assessment reported that she believed Carol demonstrated good comprehension but had visual processing difficulties with decoding and recognizing word patterns. The school reported that she was participating in tiered literacy instruction within an intervention class. In addition, her guardian completed a home and family background survey prior to the intervention and shared that Carol was struggling to read at grade level and had a hard time concentrating. Lastly, Carol's mother also shared that they had many books about a variety of subjects in their home.

Instrument Used in Data Collection

Surveys used to collect demographic and descriptive data about the participant included a home and family background survey and a school information survey. Both surveys were submitted prior to the start of the program. In addition a student interest inventory was administered on the first day of testing in order to determine topics of books Carol would like to

read. A Motivation to Read Survey (Malloy, Gambrell, & Mazzoni, 2013) was also given on the first day. This survey is used to measure the child's interests and attitudes regarding reading. The assessment includes a multiple-choice section and a one-on-one interview with the student.

The Qualitative Reading Inventory-5 (QRI-5) (Leslies & Caldwell, 2011) was used as the primary data source for the research project. This informal assessment was used to determine the highest instructional level for the participant. The assessment was administered individually to provide data regarding word identification, reading fluency, retelling, and reading comprehension. The results of this assessment were used in selecting reading materials to be used during the intervention. Furthermore, this assessment provides a starting point for comprehension instruction. The QRI-5 was also used at the end of the intervention to assess student growth. In addition to the QRI-5, the Dr. Seuss Reading Words (Santa & Hoiem, 1999) were used to assess the participant's recognition of common word families, spelling patterns, and rimes. This allowed for additional instruction in decoding for participants with those needs. Considering Carol was a Learning to Read student, she required additional instruction in decoding. Oakhill (1993) also affirmed that students who are still learning to read require word recognition and decoding instruction taught concurrently with inference making skills. This will produce a higher increase in reading comprehension.

Rainstorm (Lehman, B., 2007), a children's wordless book, was used as a pre-test for analyzing the participant's ability to make inferences. This method was also used by Tompkins, Guo, and Justice (2012). In Tompkins et al. (2012) argued that a child's ability to make inferences spontaneously is associated with their abilities in reading comprehension. The amount of emotion, casual, goal, and action-related inferences made were recorded. This wordless book assessment will demonstrate that with explicit instruction on inference making,

the amount of inferences the participants make will increase during the duration of the intervention. At the end of the intervention, a different (but similar in length and complexity) wordless book was used to conduct a post-test recording the amount and types of inferences made. In addition, inference making and comprehension informal assessments were given at the end of each week to track progress. These assessments included researcher-created questions and charts to tally the amount of inferences made while reading an unfamiliar fiction book. While the participant read, the researcher asked inferential questions and recorded the amount and type of inferences logically made before, during, and after reading.

Description of Procedure Used

After the pretests were completed, a twelve-day comprehension intervention began. The twelve days were broken up into three segments. Generally, each segment included three-four days of instruction depending on how quickly the participant grasped the strategy. During each segment, strategies were first modeled, then used in guided practice, and finally done independently with supervision. This gradual release method was used in several studies including Scharlach (2008) “START Comprehending” interventions. It is crucial that when the intervention ends students are able to utilize the strategies independently. This will ensure the participants have a higher probability of maintaining their increased comprehension levels.

The first segment of the intervention included explicit instruction of inference making with extensive modeling. While reading a narrative text with the interventionist, the participant was trained on how to identify literal versus inferred information. This task was explicitly modeled with think alouds. Then the interventionist wrote down a piece of information from the text and Carol was asked to place in the correct column (inferred or literal). Once Carol reached

at least 90% accuracy, she was able to work independently. Finally, she progressed into extracting her own literal and inferred information.

The second segment included explicit instruction on what readers use to make inferences. Extensive modeling and practice on using prior knowledge, images, and what the text says occurred via think alouds during this second segment. This was modeled through making inferences by completing an unfinished short passage, writing about an independent image, or filling in empty comic word bubbles. This later developed into making inferences while reading aloud with the instructor. This phase also included instruction with analogies and riddles. These strategies were used by Yeh, McTigue, and Joshi (2012). Yeh et. al. (2012) argued that these basic word and small passage connections can help students make larger connections when reading a complete story.

The third segment focused on combining the taught strategies and working towards independent practice. The participant read short narratives while generating inferred and literal information. At the end of each story, comprehension questions were asked to determine the progress of the participant. The final segment largely focused on reading narrative mysteries, which, with their inquisitive structure in nature, allowed for a healthy amount of inference making. Use of narrative mysteries for inference generation was also used by Yeh et. al (2012) as the final step after analogies and riddles were mastered. The participant was also now required to not only determine which information was inferred or literal, but also verbally explain how they came to that conclusion. An increase of verbal metacognition (as modeled during the segment one and two by the interventionist) was expected to transpire solely via the participant during this final phase of instruction. If the participant was not thinking aloud, open-ended questions were used as guidance.

As stated previously, during all three segments, Carol also required decoding and word recognition instruction. This was taught for the first 10-15 minutes of each session. Instruction included word sorts to review word patterns, flashcards to become more familiar with high-frequency words, and a Four Square (determining definition, synonyms, antonyms, and connections from life) strategy to explore vocabulary words used in the text.

Description of Data Collection

An analysis of the QRI-5 informal assessment data determined the effects of prediction and inference making instruction on reading comprehension of elementary school students. All readings and answers were audio recorded. The participant was provided with a word list and asked to pronounce each word on the list. The word list was then used to select a passage at an instructional readability level appropriate for the participant. A narrative passage included conceptual questions to determine if the passage included familiar or unfamiliar concepts. While the student read the passage orally, miscues including omission, insertion, and self-corrections were recorded by the examiner.

Pre and post assessments. The QRI-5 assessment provided reading fluency percentage, retelling percentage, and a comprehension percentage that distinguishes between without look-backs and with look-backs and also whether the questions required explicit or implicit information from the text.

Retelling. After the student completed reading the passage during the pre and post assessment, the student turned it face down and was asked to retell the passage back as if telling it to someone who had never heard it before. Therefore, they told the interventionist what the author wrote to the best of their knowledge and memory. The participant was encouraged to

retell it in sequence, but any information that was retold accurately was included in their percentage of retelling.

Comprehension. The questions in the comprehension section were scored using the suggestions provided by the QRI-5 manual. These questions were scored on a one point system as either correct or incorrect. The comprehension percentage was determined by adding up the correct amount of answers and dividing it by the total number of questions. The comprehension questions included four explicit and four implicit questions. Look-backs were not used in this assessment, in order to determine what the student was able to initially infer.

Weekly formative assessments At the end of each week formative, informal assessments and observations were used to direct the upcoming week's instruction. The student was asked to read a narrative text while being audio recorded. The interventionist asked inferential questions with follow up questions asking the student to explain how they produced their answer. The recordings were then analyzed for areas of strength and weakness to determine which types of inferences (causal, emotional, goal, action) needed further instruction.

Conclusion

This action research project is being conducted in order to determine if instruction of prediction and inference making will have an effect on an elementary-school student's overall reading comprehension. In addition, it was determined that a Learning to Read student must also be taught decoding and word recognition skills concurrently. The sample included one nine-year old female entering third grade. She is from a suburban school, but from an economically challenged household. The interventionist administered the QRI-5 reading assessment as a pre and post test measurement of growth. A reading intervention, divided into three segments, was

used to increase inference-making skills over twelve days of 55-minute one-on-one lessons. Previous research suggests that this type of intervention will increase a participant's reading comprehension.

By the end of the study, it is expected that the posttest results will show an overall increase in reading comprehension due to the explicit instruction, modeling, and guided practice in regards to inference making. The results of the action research project will be discussed in the following chapter.

Chapter IV

Results

The purpose of this study was to determine if explicit instruction of prediction and inference making will have an effect on an elementary-school student's overall reading comprehension. Based on the research presented in previous chapters, the instruction of prediction and inference making included explicit instruction and explanation of literal and inferred information and how we make inferences (prior knowledge, images, text). Data was collected through an inference making pre and post-assessment, weekly formative assessments with narrative texts, and a pre and post-intervention reading assessment. This data was collected to determine the effects, if any; that the intervention had on the participant's overall reading comprehension. The conducted research examines the following question: "What effect does explicit instruction on predictions and inference making have on the reading comprehension of an elementary school student with dyslexia?"

Carol's (pseudonym) inference making assessments included the narration of a wordless book. This was used as a prompt to assess the amount and types of inferences she currently

could make. A narrative including only literal information was created by the researcher to make comparisons and tally the types of inferences made. Utilizing a wordless book allowed any barriers regarding decoding to be absent and for inference making to be solely assessed. Additionally, weekly audio recordings were used to analyze the progress of amount and types of inferences made while reading short narrative stories. Throughout the twelve sessions, observations regarding her use of the strategies were recorded. A post-assessment of a different, but similar in complexity and length, wordless book was given to record inference making growth.

Overall reading comprehension growth was measured using the Qualitative Reading Inventory (QRI-5) (Leslies & Caldwell, 2011). The interventionist at Cardinal Stritch University's Science Literacy Summer Program administered the QRI-5 prior to the intervention sessions and again during the last session. In order to measure the participant's decoding and word recognition skills the Reading Dr. Seuss Words! (Santa & Hoein, 1999) was also administered and use to guide any word-level instruction if necessary. Additionally, a Motivation to Read Survey (Malloy, Gambrell, & Mazzoni, 2013) along with a one-on-one interview was administered to determine the student's current attitudes and preferences about reading. In this chapter, observations, qualitative and quantitative data, and results from assessments will be examined.

Pretest Results

The student in this study participated in several pre-assessments. The first, the Qualitative Reading Inventory (QRI-5) (Leslies & Caldwell, 2011) measured the student's oral word reading accuracy and the rate of reading within the context of a narrative text. In addition, it measured

comprehension through retelling and explicit and implicit comprehension questions. Passages were determined either familiar or unfamiliar based on conceptual questions delivered prior to the assessment. In this study, only familiar passages were used in order for the participant to activate prior knowledge (a strategy for inference making). To determine a student's reading level, several passages were administered until an instructional level was found (Independent, Instructional, or Frustration are possible levels). An instructional level was determined once the student had read the selection with at least 90% accuracy and 67% comprehension. The participant was considered to be at a frustration level if below either of these percentages.

Although Carol is going into fourth grade, according to the QRI-5 (Leslies & Caldwell, 2011) pretest, she is at a second grade level in regards to word identification. When observing her read the assessment, she used context clues to aid her when she could not identify a word. According to the QRI-5 (Leslies & Caldwell, 2011), students at a third grade reading level should be reading 56-104 words per minute and 53-101 correct words per minute. Carol read the 2.0 leveled passage at 54 words per minute (50 correct words per minute) and the 2.3 leveled passage at 44 words per minute (38 correct words per minute). Therefore, she is at the lower end of the fluency spectrum for her grade level. Carol's miscues on the QRI-5 (Leslies & Caldwell, 2011) pre-assessment suggested a need for sight word and word pattern instruction. The QRI-5 provides a Total Accuracy and Total Acceptability rate. The Total Accuracy rate is determined by adding up all of the miscues (insertions, omissions, substitutions, reversals, and self-corrections), subtracting them from the total words, and then dividing that sum by the total amount of words. On the 2.3 passage, Carol had a Total Accuracy rate of 88%. In addition, the QRI-5 provides a Total Acceptability rate. This is calculated by examining miscues, and finding the sum of all meaning-changing miscues. This number is then subtracted from the total of words

and that sum is divided by the total number of words. When reading the 2.3 passage, Carol had a Total Acceptability rate of 96%. This means that although she had 36 miscues, only 13 were meaning-change miscues.

Conversely in regards to comprehension, Carol had 100% accuracy (Independent) for explicit and implicit questions when presented with a 2.0 grade level passage. Therefore, the higher level passage (2.3) was administered. Her comprehension percentage dropped to 75% (Instructional) when given this higher level passage. This demonstrates that she can complete beginning second grade level comprehension questions with the aid of instruction. On both passages, Carol's retelling was above average. According to the QRI-5, students should be able to retell second-grade leveled texts with 43% accuracy. Carol retold the 2.0 leveled text with 66% accuracy and the 2.3 leveled text with 41% accuracy.

The second pre-assessment was the Reading Dr. Seuss Words! (Santa & Hoein, 1999). This assessment measured the student's phonemic decoding skills by using nonwords of a variety of complexity, which range from CVC to CCVCC. Two scores are recorded on this assessment: correct words and correct vowel sounds. The participant could still get the correct vowel sounds if there were only miscues with the consonants. Carol was proficient (90%) in decoding the correct vowel sounds of short *a*, *i*, *u*, and *o*, but struggled to get the correct words due to difficulties with consonant blends and diagraphs within the nonwords. She was able to decode short *o* with the highest accuracy. Carol had the lowest accuracy (30%) with short *e*, therefore instruction with word recognition and word sorts began with short *e* words.

The third pre-assessment consisted of the Motivation to Read Survey (Malloy, Gambrell, & Mazzoni, 2013) and a one-on-one interview to assess Carol's attitudes and preferences about

reading. When analyzing Carol's self-concept as a reader, she scored 26 out of 40 possible points. When analyzing her value of reading, she scored 33 out of 40 possible points. She received a total of 59 out of 80 points. During the one-on-one interview, Carol said she was a good reader. She said the easiest thing about reading is sounding out words and that the hardest thing about reading is coming across a big word that makes odd sounds. She stated that she believes that to become a better reader she must keep practicing. Carol said that in order for a teacher to help her become a better reader, the teacher should know what level she is at and help her get to the next level when she is ready. Carol enjoys *Junie B. Jones* stories by Barbara Lynne Park for fictional reading and books about animals for nonfictional reading. She said she reads chapter books at school and at home and knows how to determine if she will like a book ahead of time. She stated that she will flip through a book and read the title to preview a book. Based on her comments, Carol understands that literacy is important to success in life. She cited needing to fill out applications, signing up for things, reading road signs, and buying a house as times she will need to read in her adult life. This assessment provided the researcher with high interest reading materials to use for instruction and insightful information about how Carol views herself as a reader.

For the final pre-assessment, the wordless book, *Rainstorm* (Lehman, 2007), was given to Carol to narrate. She was instructed to describe what was happening in each picture and to explain the story that was being told through the pictures. This assessed the participant's current abilities regarding prediction and inference making without the barriers of decoding and word recognition difficulties. While Carol narrated the book, an audio recording was used to compare it to the researcher-created narrative. This narrative included only literal information taken from the pictures. The analysis of Carol's narrative included a tally of the amount of inferences made

in the following categories: emotions, causal, goals, actions. During her narrative, Carol made three emotional, four casual, 16 action, and zero goal inferences. This analysis demonstrated the student's current capabilities of inference making, and also provided a starting point for what inferences to teach with more frequency. In Carol's case, she was able to make inferences about the character's actions with ease, but needed more instruction about how to determine emotions, causes, and their goals.

Examples of How Inferences were Recorded	
Type of Inference	Verbal Example
Emotion	He's sad because it's raining out.
Casual	He's reaching under the chair to get the ball, 'cause he kicked it under there on accident.
Goals	Not made: He wants it to stop raining so he can go outside.
Actions	He's yawning and waking up the next day.

Table 1: Examples of how inferences were recorded

Intervention Results

As described in Chapter Three, the intervention was divided into three segments: explicit instruction of defining inferences through modeling, guided practice of making inferences with narrative texts, and finally putting it all together with a focus on independent practice. During each of these segments of instruction, formative data and observations were collected.

Segment one: Defining inferences through modeling and explaining. During this first segment of instruction the following essential question was addressed: "What is the difference between literal and inferred information?" First, terms were defined by using the vocabulary method called Four-Square. In the middle of the vocabulary graphic organizer Carol wrote the

word and then determined a synonym, antonym, characteristics, and examples for our lives. Next, a three column chart with the headings “Literal,” “Inferred,” and “Maybe” was used to place textual information into. This three-column chart was also used by Thornley, Selbie, and McDonald in their studies of increasing inferences (2011). At the beginning stages on day one, a think aloud was used to model how to determine where the information would go. By day two, a piece of information was written a small white board and Carol would place it into the correct column. It was noted on day two that although Carol’s comprehension levels seem high she was struggling to understand the difference between literal and inferred. She was not ready to for guided or independent practice until day three.

It was also noted that during a few diagnostic narrative readings that Carol made logical and often correct inferences about what would happen next. Frequently, she predicted how a character felt and could verbally explain that she based it on previous experiences. However, she had difficulty in determining inferred goals of characters. Therefore, characters goals were an inference focus throughout segment two.

In regards to her decoding skills and instruction, it was clear that Carol was depending on pictures and context too often for decoding. Particularly when reading nonfiction, Carol often guessed at larger content-based words. As she guessed what the word was, she would look up at the interventionist which suggested that she was not attempting to decode as she read. However, she had a large memory for content-based words (ex. Herbivore, cold-blooded). It was determined that decoding strategies were a necessary component throughout all segments for improved comprehension. During the first segment, *Words Their Way* (Templeton, Bear, Invernizzi & Johnston, 2010) was used to create word sorts and memorize common word

patterns. Due to the pretest results, Carol spent the first segment practicing short *e* words and memorizing common short *e* patterns.

An additional instructional tool used near the end of the first segment was practicing analogies. This was used in a study by Yeh, McTigue, and Joshi to increase the connections made at the basic word level (2012). It was clear that Carol comprehended majority of the analogies she was presented with, but decoding and lack of prior knowledge were the main barriers between her solving some of the more difficult analogies. Overall, Carol seemed to have some visual processing issues at different times while reading. Sometimes she would be very focused and read more fluently, and at other times she stumbled over words and made many guesses.

Segment two: Making inferences through guided practice. During the second segment of instruction, a conference with the interventionist and Carol's parents was held. For the first time, it was shared that Carol was diagnosed with dyslexia. Her parents explained that she had been referred to special education services at her school in the past, but did not qualify. The conversation affirmed the interventionist's findings regarding visual processing difficulties. It was earlier noted that Carol was depending on pictures and context too often for decoding. When moving forward with instruction, special considerations were taken particularly when analyzing results of progress and assessments. During this second segment of instruction the following essential question was addressed: "What is used to make inferences?" Therefore once the term "inferred" was clearly defined as different from "literal," the way in which inferences are made was explicitly taught. The focus shifted from activating prior knowledge, to using images within the text, and finally to what the text is implying.

Prior knowledge was activated before reading and also throughout a narrative text. For example, when making inferences about a singular image of a young boy carrying a garbage can she wrote, “On Tuesday it is garbage day so he’s taking out the trash.” When asked how she came to this conclusion, Carol explained that it was her brother’s chore to take out the garbage at home. Singular images graduated into comic strips with empty bubbles. Facial expressions were explicitly taught as a way to infer how a character is feeling. Carol used these in her own comic to determine a woman was sad or that a man felt bad for her because he took his hat off and frowned. During the second segment the three-column chart (literal, inferred, maybe) graduated into a more sophisticated graphic organizer. This now included the following columns: “Event,” “What I Think Will Happen,” “Clues from The Story,” and “What Really Happened.” This graphic organizer required Carol to find the textual evidence (“Clues from The Story”) to support her inferences. As Carol progressed, guided practice shifted to independent practice. During the second segment, Carol became more comfortable with speaking about her inferences and how she drew these conclusions. She recognized that she was putting together a lot of information that was not explicitly written and demonstrated pride in her capabilities. The following week she began to work more independently to help increase her confidence-

During the second segment Carol graduated from solving analogies to solving riddles and writing her own. Carol was able to solve riddles about animals and nature with ease. She enjoyed creating her own riddle and was able to make connections from the riddles she had read into the creation of her own riddle. In addition, to increase Carol’s fluency, a paired reading strategy was used. This strategy was also used to increase Carol’s confidence when reading slightly challenging texts. When starting to read, Carol and the interventionist read together. As Carol became more comfortable, the interventionist would fade out to a lower volume and eventually

allow Carol to read independently. When Carol began to struggle or become fatigued from reading the interventionist would join back in to help Carol continue. This would repeat through the reading of a short story or chapter. Along with the paired reading, the amount of word sorts and sight word flashcards increased and were used for about ten minutes during the start of each 55-minute session. The fluency in which Carol was able to go through her flashcards and word sorts increased during the second segment. By the end of the second segment, Carol was able to read 34 out of 36 sight words with 100% accuracy and automaticity. Carol also mastered her short *e* words with 100% automaticity and moved onto words with *sh*, *ch*, *ss*, and, *ck*. By the end of the second segment, Carol was able to read the consonant blend words with 90% automaticity. Finally, the interventionist noted that Carol had increased fluency when reading short *e* and consonant blend words within narrative texts.

Segment three: Putting it together with independent practice. During the third and final segment of the intervention, Carol engaged in more independent practice. A discussion was held about how making connections through analogies, riddles, and now short mystery stories, could help increase the overall ability to make inferences and make connections within a text. The skills taught with making predictions and inferences, solving analogies and riddles, and using the inference-making graphic organizers were now used while reading short mysteries. Stories from David A. Adler's *Cam Jansen Mystery* series were used for Carol to work independently. At the beginning of the third segment, Carol would read the stories out loud with minimal paired reading and fill out the graphic organizer as she read. By the end of the final segment, Carol would read independently and then would go through her work with the interventionist to check answers and verbally discuss the answers she wrote down. During these discussions Carol would support her inferences through discussion. For example Carol would tell

the interventionist an inference, “She’s not supposed to do that.” A follow up question would be asked, “How do you know?” Carol then responded, “Because she is tiptoeing to the kitchen.” When analyzing the final graphic organizer she completed through independent practice, it was clear that Carol was able to generate inferences, but had trouble locating clues within the text for support. During discussion she could verbalize it, but struggled to write it down independently.

In order to continue increasing fluency, consonant blend word sorts were used until 100% accuracy and automaticity were achieved. This was achieved during the final days of the intervention, and then contractions were introduced as a final word sort lesson. It was noted during interventions that several miscues were occurring when contractions were present (i.e. “isn’t” instead of speaking “it’s”). Additionally by the end of the final segment, Carol was able to accurately and automatically read 52 sight words through flashcard repetition.

Finally, during the end of each week the interventionist recorded Carol reading a short (10-13 pages) narrative. This recording was used to tally the amount of emotional, causal, goal, and action inference questions that Carol was able to answer. If she said, “I don’t know” or came up with an illogical answer, the answer was not tallied. Over the course of the four-week intervention, there was a gradual but positive increase. Carol seemed to make inferences about actions and emotions with ease, but needed additional guidance when making inferences about cause and effect and also character goals. These formative assessments allowed the interventionist to focus on these more challenging areas as the weeks progressed.

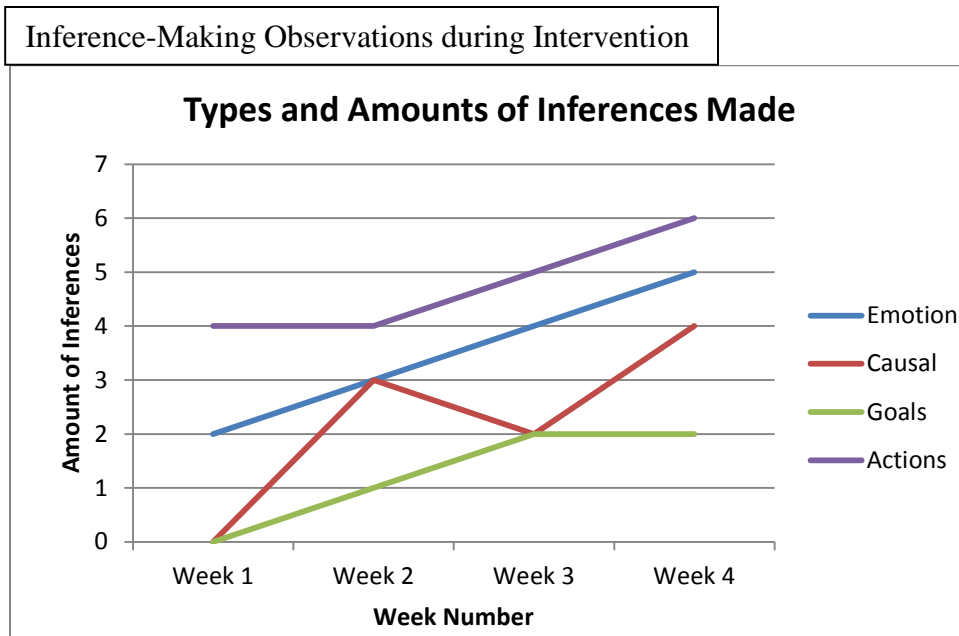


Figure 1: Types and Amounts of Inferences

Posttest Results

Qualitative reading inventory. As used during the pretest, the QRI-5 (Leslies & Caldwell, 2011) was used to measure reading comprehension. First, the word identification list was read to determine an instructional level. The results of the word list show that Carol has made progress in her word recognition skills. Although both test yielded Carol’s instructional reading level to be at the third grade, the percentages in which she was able to automatically identify words at the primer 2/3, first, second, and third grade levels increased after the intervention. Additionally she was able to identify more words at the second and third grade level as well.

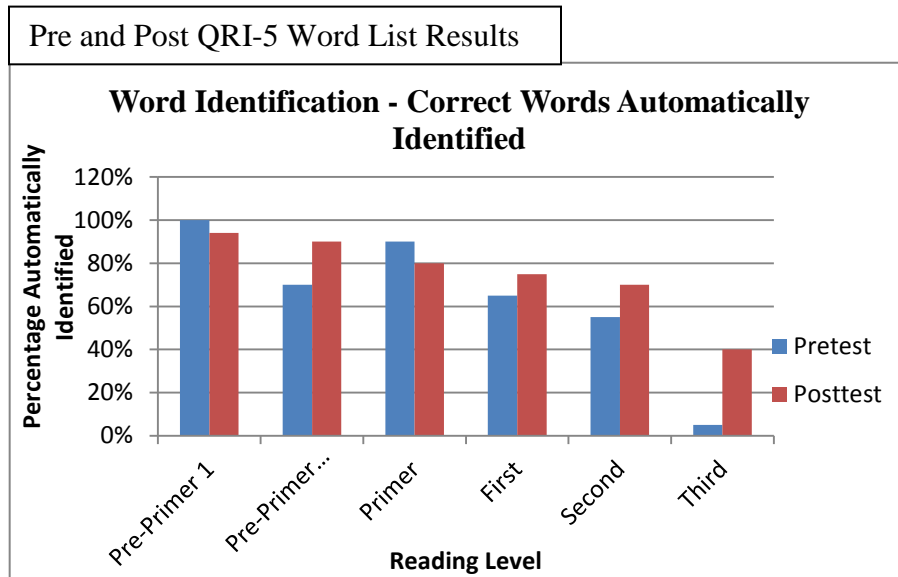


Figure 2: Word Identification – Correct Words Automatically Identified

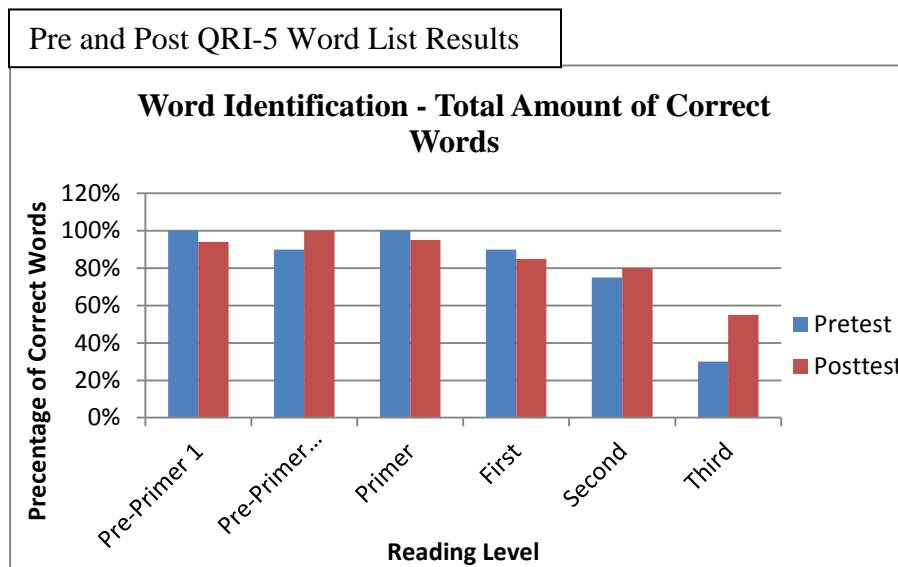


Figure 3: Word Identification – Total Amount of Correct Words

The first passage administered was the same 2.3 grade-leveled passage used during the pretest: “My Family’s First Trip.” Both the amount of miscues and meaning-changing miscues decreased and her words per minute (WPM) and correct words per minute (CWPM) increased.

Carol’s word per minute increased from 44 WPM to 55 WPM. Carol’s correct words per minute increased from 38 CWPM to 55 CWPM.

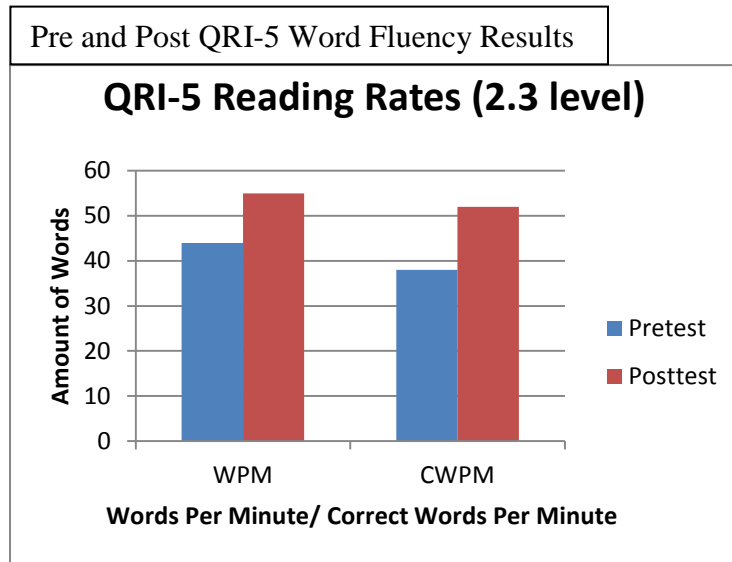


Figure 4: QRI-5 Reading Rates (2.3)

In addition to Carol’s reading rates increasing, her comprehension rates increased as well. Carol’s comprehension percentages increased in the following areas: retelling from 41% to 44%, explicit answers from 75 to 100%, and overall comprehension 75% to 88%. The only area in which she did not increase was implicit questions (75%). Considering that Carol had heard this story and questions before, additional passages were used for further assessment.

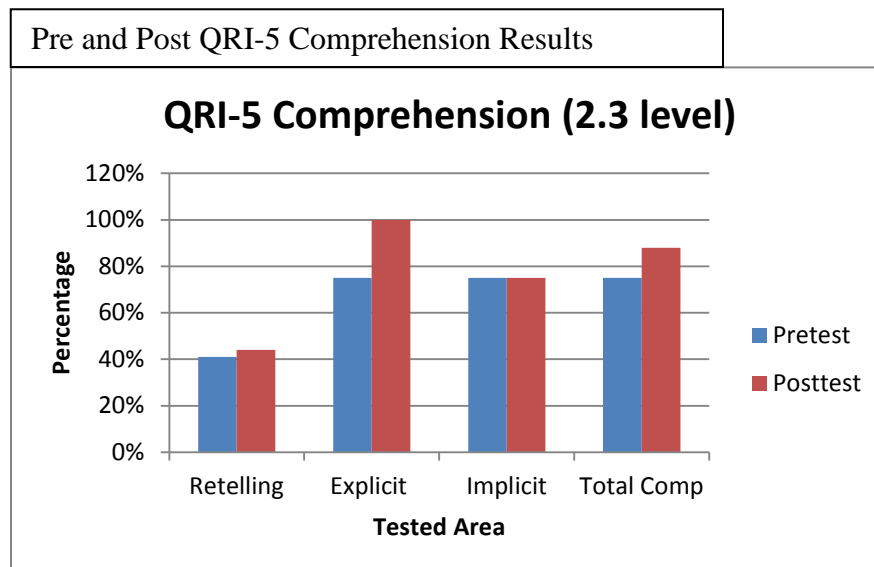


Figure 5: QRI-5 Comprehension (2.3)

List of QRI-5 Passage Titles	
Grade Level	Name of Passage
2.0	“What Can I Get For My Toy?”
2.3	“The Family’s First Trip”
2.7	“Father’s New Game” (images)
3.2	“Special Birthday for Rosa”
3.4	“The Trip to the Zoo”
3.8	“A New Friend from Europe

Table 2: List of QRI-5 Passage Titles

After the same passage was used to assess progress, three more passages were used in order to reach Carol’s frustration level and to determine her current instructional level. During the pretest, Carol’s instructional level reached a 2.3 grade level. During the posttest, Carol reached a 3.4 grade level of instruction. It was determined that this was her post-intervention level, because once she read the 3.8 leveled passage, her comprehension dropped below 67%. However, when analyzing the results of all QRI-5 passages, her performance did not necessarily decrease as the grade level increased, instead there was some fluctuation. The 2.7 leveled passage was the only passage that included images.

QRI-5 Posttest Results						
Grade	Accuracy	Acceptability	Retelling	Comp	WPM	CWPM
2.3	90%	98%	44%	88%	58	52
2.7	94%	99%	51%	88%	69	65
3.2	89%	98%	35%	100%	52	47
3.4	86%	97%	44%	75%	57	49
3.8	82%	94%	31%	62%	38	31

Note: Grade leveled text, Total Accuracy, Total Acceptability, Retelling, Overall Comprehension, Words Per Minute, and Correct Words Per Minute

Table 3: QRI-5 Posttest Results

In order to assess recognition of common word families, spelling patterns, and rimes the Reading Dr. Seuss Words (Santa & Hoein, 1999) was also used as a posttest. Each word family includes ten words that the participant must read, with the exception of the mixed vowel portion that has twenty. The results revealed that Carol was able to increase the amount of words she was able to read correctly. There was an increase with short *i*, short *e*, short *u*, and mixed vowel patterns. The amount of short *a* words read correctly did not change, and the amount of short *o*, words decreased from 100% to 80%. The main focus of the intervention was related to short *e*, as this was Carol’s lowest percentage on the pretest. Therefore the 30% increase shows the result of this intervention. In addition, the intervention regarding consonant blends could correlate to the 20% increase in the mixed vowel portion.

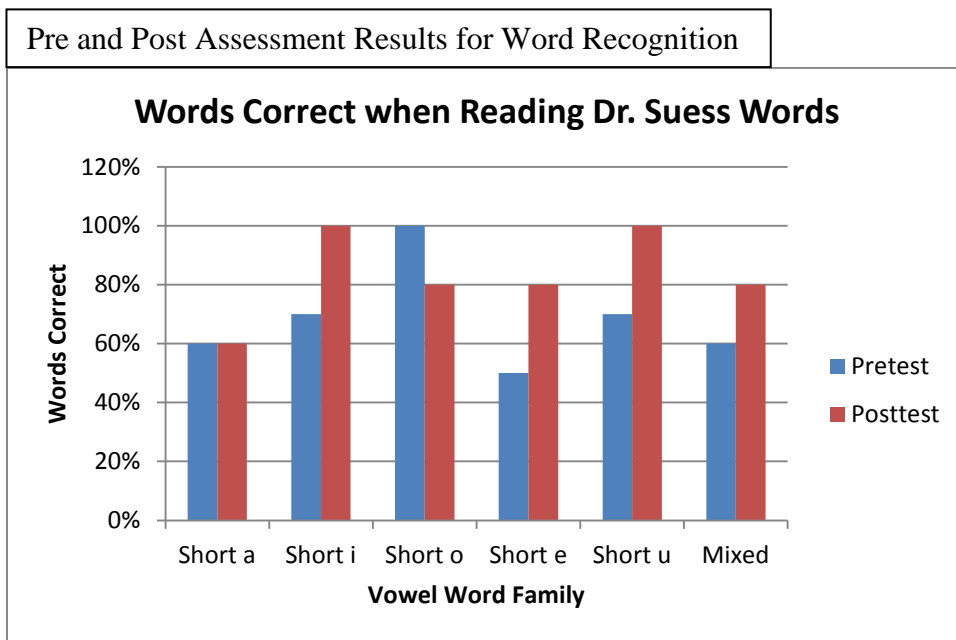


Figure 6: Assessment Results: Reading Dr. Seuss Words

When comparing Carol’s responses on the pre and post interview of the Motivation to Read Survey (Malloy, Gambrell, & Mazzoni, 2013), her responses were almost identical. During

the posttest she did mention a new strategy for teacher's to help her become a better reading. Carol said that a teacher could have her write a story about something, then go over what she got wrong and then that would help her the next time she saw it in a story. She also added that at school her reading helper doesn't let her read hard chapter books, because they are too hard, but when she is at home she reads chapter books with the assistance of her mother. Lastly she shared that she knows how to use the electronic card catalog at her school and often uses it to find books that she is interested in reading. Overall the pre and post interview revealed that Carol is very aware of the important role literacy plays in her life. She also has a very positive attitude about reading and her ability to become a better reader.

In order to measure Carol's inference making skills, a different wordless book was used for the posttest. David Wiesner's *Flotsam* was chosen due to its similar complexity and length. *Flotsam* (Wisner, 2006) is 31 pages in length that includes 60 separate images. In comparison, *Rainstorm* (Lehman, 2007, the wordless book used during the pretest, is 29 pages in length that includes 53 separate images. The posttest showed an increase in Carol's inference making abilities with all inference types. When making inferences about the characters' goals, Carol made zero inferences during the pretest and seven during the posttest. Additionally her causal inferences increased from four to thirteen and emotional inferences increased from three to nine. Overall, Carol became much more aware of activating her ability to make inferences in order to increase her reading comprehension.

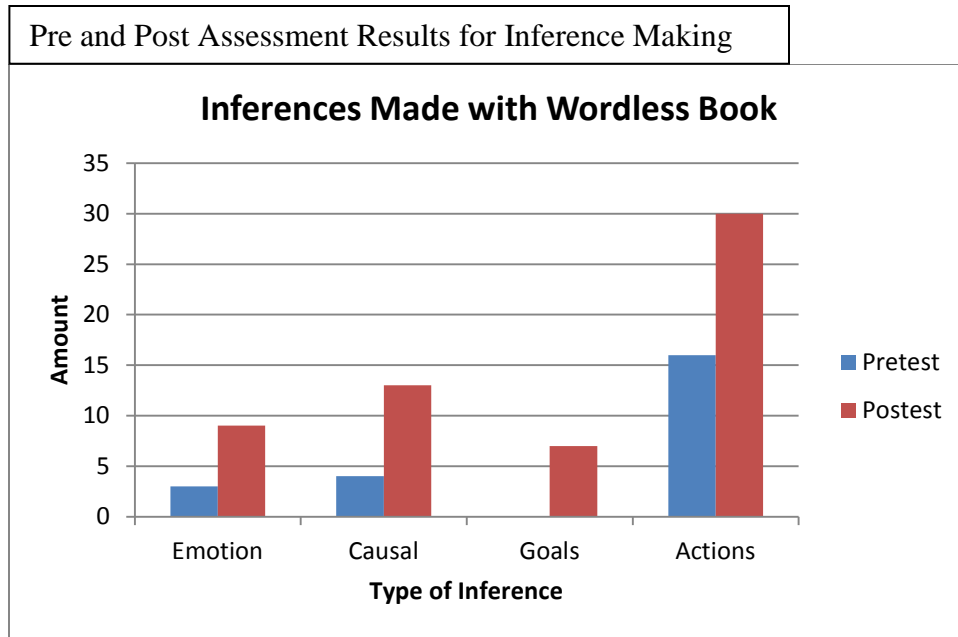


Figure 7: Inferences Made with Wordless Book

This chapter described the aim for the pre and post assessments and explained data from several informal assessments that were collected throughout the intervention. In addition, observations along with diagnostic and formative assessments made during the intervention were highlighted. A description of the collective data in the areas of comprehension, word recognition, reading attitudes, and inference making was followed by a discussion of the results obtained from the participant. The participant demonstrated growth in word recognition and inference making and in turn also increased her instructional reading level. Chapter five will analyze these data and provide insights from the observed results. Ultimately, recommendations for future research and practice will be presented to illuminate the significance of this study.

Chapter 5: Conclusions

This study examined how the explicit instruction of prediction and inference making skills affects the overall reading comprehension of an elementary-school student. The student

that participated in the study was assessed with several pre and post assessments, as well weekly formative, informal assessments.

The intervention consisted of four weeks of word recognition instruction paired with explicit instruction of inference making skills with narrative texts. The intervention occurred during 55-minute sessions in a one-on-one setting at the Cardinal Stritch University Science Literacy Program. The intervention was divided into three segments that moved the student from observing modeling, to guided practice, and finally to independent practice.

A variety of formal and informal assessment data were collected to monitor the participant's progress. In order to monitor progress with word recognition, new words and vowel families were added once the participant reached mastery (90%) with automaticity. Inference making skills were monitored through the student's think alouds and verbal questions that required inferential information while reading narrative texts. Finally, overall comprehension was assessed through the Qualitative Reading Inventory-5 (QRI-5) (Leslies & Caldwell, 2011). In the previous chapter, data from the pre and posttests were discussed, as well as from the weekly informal assessments. This chapter explains the results of the assessments in consideration of existing research as well as highlights the strengths and weaknesses of the current study. Finally, recommendations for additional action research on the topic of inference making to increase comprehension will also be presented.

Explanation of Results

A variety of data was collected through formal and informal assessments throughout the four week intervention. This section will discuss an analysis of the formal pre and post

assessments. In addition, connections will be made to the intervention process and the noted progress.

Word recognition results. When comparing the results of the pre and post Reading Dr. Seuss Words (Santa & Hoein, 1999) assessment, there is a trend in increased automaticity. The intervention largely focused on words with short *e*, and there was a 30% increase in Carol's automaticity and accuracy with these words. In addition, the participant's words per minute and accurate words per minute increased when she read the same passage from the Qualitative Reading Inventory (QRI5) (Leslies & Caldwell, 2011) after the intervention. These results suggest that the use of sight-word flashcards and word sorts are effective for increasing the speed and accuracy of word recognition in elementary school students, particularly those with dyslexia.

Inference making results When comparing the results of the pre and post Wordless Book assessment, there is an increase in the amount of inferences being made. During the pretest, Carol mainly made inferences about the character's actions by looking at the images. After explicit instruction regarding the use of images, and specifically facial expressions, Carol made many more inferences regarding character emotions. In addition, the instruction included making predictions and then checking them to reveal cause and effect. This suggests that this instruction provided a foundation for the increase in Carol's ability to make casual inferences. Finally, the observations and audio recordings demonstrated an increase each week of Carol's amount and types of inferences being made, and this trend was confirmed when examining the posttest results. These results suggest that explicit instruction of inference making through modeling and guided practice will increase an elementary school student's ability to make inferences when reading narrative texts.

Comprehension results. When comparing the results of the pre and post Qualitative Reading Inventory-5 (QRI-5) (Leslies & Caldwell, 2011), there is an increase in the percentage of retelling, explicit and implicit questions correct, and overall comprehension after the intervention. In addition, Carol was able to increase her instructional level from a 2.3 grade level to a 3.4 grade level. These results suggest that her growth in word recognition and inference making skills allowed her to comprehend higher grade level passages.

Connections to Existing Research

Locascio, Mahone, Eason, and Cutting (2010) and Oakhill's (1993) agreed that fast word-recognition is not required for good comprehension. This research is important to consider when providing comprehension instruction for students with dyslexia. Although dyslexia is not curable, it can be remediated. Therefore, it is important that students with dyslexia (and all struggling readers) are provided with comprehension skills to overcome decoding difficulties. The study conducted by Eilers and Pinkley (2006) further suggests that teaching through the use of metacognitive strategies such as think alouds and explicit modeling can increase a student's reading comprehension. This model was used during the first segment of the intervention, but the participant quickly graduated to independent metacognition. The study conducted by Kolić-Vehovec and Bajšanski (2006) more specifically called for metacognition through comprehension monitoring. This was used during the intervention through graphic organizers that progressed from simply determining if whether information was literal or inferred to checking predictions and locating the evidence that proved or disproved the predictions.

Cain and Oakhill (1999) took their research a step further to suggest that not just metacognition can improve reading comprehension, but explicitly a stronger awareness of

inference making. The researchers determined that when a child's ability to make inferences is poor, so is their ability to comprehend a text. This study, among others prompted a closer look into the effects of explicit instruction of inference making to increase reading comprehension. The study by Fritschmann, Deshler, and Schumaker (2007) along with the study by Yeh, McTigue, and Joshi (2012) used and suggested a scaffolded approach when teaching inference making skills. A scaffolded approach was used in the current study by moving from not only modeling to independent practice, but also from analogies to short mysteries during the intervention.

In addition, the study by Tompkins, Guo, and Justice (2012) inspired the use of wordless books to analyze inference making skills without the barriers of decoding and word recognition. This approach became crucial when working with a student with dyslexia. When using this approach with Carol, it was clear that she was able to make more inferences without these barriers and that with more word recognition drills and inference making instruction, her instructional level would continue to increase. Finally, a study conducted by Glaubman and Glaubman (1997) suggested that during any intervention the model of gradual release is essential. This was used in the current study through the utilization of three separate segments that ended with independent practice.

Strengths and Limitations of the Study

This study has strengths and limitations; among its strengths was the scaffolded and segmented instruction of inference making. One of the greatest outcomes of this strength was the participant's increase of instructional reading level. Based on the data of the pre and post assessments, this action research project shows improvement in the participant's comprehension

through the percentages of retelling and explicit and implicit questioning. The use of graphic organizers seemed to serve as a valuable tool for comprehension monitoring. They served as a guide for Carol to follow, and therefore she was able to progress to independent practice.

One area of both relative strength and limitation would be having the ability to work one-on-one with the participant. In other groups within the Cardinal Stritch University's Science Literacy Program, it was noted that the participant was less focused and more hyper when with other students. When working on-on-one with the interventionist, Carol was focused and determined to improve her reading skills. Although this strength aided in providing optimal increase of skills during the intervention, the weakness remains that may not be transferable to the classroom.

Another limitation of this study was the length of the intervention. Although much could be achieved in 55-minutes, due to pre and post tests, only twelve days were available for actual instruction. It is the interventionist's belief that an extended intervention with a focus on more independent practice could have better prepared Carol for skills that are transferable to the classroom.

One of the most crucial limitations to this study was the absence of important information about the child prior to the study. Although there were suspicions, the interventionist was not aware of the participant's dyslexia until about half way through the intervention. If this information had been provided ahead of time, further research regarding dyslexia could have produced a more appropriate approach for a student with these specific reading challenges.

Finally, when first assessing Carol's participation in the literacy program, it was clear that she also required some word recognition instruction. With this need present, word

recognition instruction was added to the intervention. Therefore, a notable limitation concerns the difficulty in determining which skill, word recognition or inference making, had a larger impact on her overall comprehension.

Recommendations for Future Action Research

As noted as a limitation, if future action research is conducted in the area of reading comprehension, it is suggested that a separation of skills, word recognition and inference making, be explicitly defined through the use of a larger sample population. Additionally, the amount of days of the intervention should increase for additional independent practice.

If future action research is to be studied regarding elementary school students with dyslexia, it is suggested that a dyslexia specialist is consulted, or additional strategies specific to dyslexia are researched prior to the intervention. The following recommendations are in regards to what Carol, and potential future participants, should pursue after the intervention.

As discussed with Carol, and confirmed with her family, the participant is reading at home frequently. However, there are a variety of activities that Carol could practice at home to continue increasing her instructional level. It is suggested that Carol not only read for fun at home, but also continue the use of sight-word flashcards in order to increase her memory of words. In addition, using word sorts as found in *Words Their Way* (Johnston, Invernizzi, & Bear, 2004) could help Carol to memorize common word patterns for decoding larger, unknown words. Reviewing a set of sight-word flashcards before bed or sorting words for just ten-minutes a day could greatly improve her word recognition abilities.

Conclusion

Overall, the results of the intervention were effective and positively affected the participant's reading comprehension skills. The results of the Qualitative Reading Inventory-5 (Leslies & Caldwell, 2011) (QRI5), demonstrated that Carol increased from a 2.3 to a 3.4 instructional level in just four weeks of intervention. In addition, Carol increased her word per minute and decreased the amount of miscues she made. It is possible that with more time, Carol could have increased her fluency and reached her current grade level of instruction. However, it is important to consider the strengths and limitations of the study. It may be difficult to transfer the intervention in this research study to a larger population of students while expecting the same results. This chapter offered academic information and instructional recommendations on ways to continue or replicate this study. In addition, the results support and expand upon the literature review that helped to develop the current study.

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