

## Cardinal Stritch University Stritch Shares

---

Master's Theses, Capstones, and Projects

---

8-28-2012

# Effects of an inference intervention for a third grader with a math disability

Megan C. Miller

Follow this and additional works at: <https://digitalcommons.stritch.edu/etd>

 Part of the [Education Commons](https://educationcommons.org/)

---

### Recommended Citation

Miller, Megan C., "Effects of an inference intervention for a third grader with a math disability" (2012). *Master's Theses, Capstones, and Projects*. 442.

<https://digitalcommons.stritch.edu/etd/442>

This Graduate Field Experience is brought to you for free and open access by Stritch Shares. It has been accepted for inclusion in Master's Theses, Capstones, and Projects by an authorized administrator of Stritch Shares. For more information, please contact [smbagley@stritch.edu](mailto:smbagley@stritch.edu).

The Effects of an Inference Intervention for a Third Grader with a Math Disability

By

Megan C. Miller

A Graduate Field Experience

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Arts

Urban Special Education

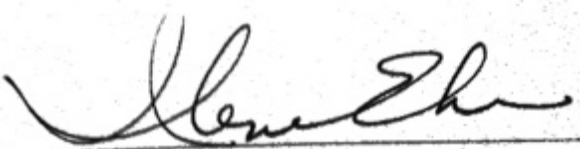
At Cardinal Stritch University

Milwaukee, Wisconsin

2012

**Signature Page**

This Graduate Field Experience  
Has been approved for Cardinal  
Stritch University by



\_\_\_\_\_  
Advisor

8/15/12

\_\_\_\_\_

## Table of Contents

<b>Abstract</b> .....	<b>v</b>
<b>CHAPTER ONE: Introduction</b> .....	<b>1</b>
Student Background.....	1
Individuals with Disabilities in Education Act.....	2
Common Core Standards .....	3
Conclusion .....	4
<b>CHAPTER TWO: Review of Literature</b> .....	<b>5</b>
Essential Literacy Components.....	5
The Relation between Reading Comprehension and Mathematics .....	14
Reading Comprehension and Attention Deficit Hyperactive Disorder .....	17
Designing an Inference-Based Intervention.....	20
Conclusion .....	25
<b>CHAPTER THREE: Procedures</b> .....	<b>28</b>
Sample Population .....	28
Description of Procedures.....	31
Data Collection .....	33
Conclusion .....	34
<b>CHAPTER FOUR: Results</b> .....	<b>35</b>
Pre-Intervention Results of the QRI-5 .....	35
Pre-Intervention Results of Informal Inference Assessment .....	38
Data Collected During Intervention.....	40
Post-Intervention Results of the QRI-5.....	42
Post-Intervention Results of Informal Inference Assessment.....	45
Conclusion .....	46
<b>CHAPTER FIVE: Discussion</b> .....	<b>48</b>
Connections to existing research .....	48
Connections to Common Core Standards.....	51
Explanation of Results .....	51
Strengths and Limitations .....	54

Recommendations for student.....	55
Conclusion .....	56
<b>References.....</b>	<b>57</b>
<b>APPENDIX A.....</b>	<b>64</b>
<b>APPENDIX B.....</b>	<b>65</b>
<b>APPENDIX C.....</b>	<b>66</b>

### Abstract

This case study investigated the effects of a repeated intervention, aimed at improving a third-grade student's ability to make inferences while reading. The participant was a 7 year old, black male from an urban, Midwest city who qualifies for special education services in the category of Specific Learning Disability (SLD) for mathematics. Making inferences was chosen as the focus of the intervention because this skill is critical not only to reading comprehension, but also to the comprehension of story problems in math, which is the student's area of need. The strategy "background knowledge + textual clues = inference" was used to infer missing words in cloze sentences and infer obscured sentences in passages, as well as answer implicit questions regarding instructional level texts. The results indicate that the participant improved in the three main intervention activities included in the daily procedures, as well as in an informal inference assessment using pictures. However, the participant's scores for implicit questions on the QRI-5, a reading assessment, did not improve. The participant's progress was complicated by struggles to attend tasks. Although the results suggest that the participant gained some of the foundational skills necessary for making inferences, it is evident that the skills have not yet transferred to making inferences for longer, more challenging passages, such as those found in the QRI-5.

## **CHAPTER ONE**

### **Introduction**

In this study, a student with a Specific Learning Disability in the area of mathematics, received an individualized intervention to address his needs in the area of reading comprehension. Reading comprehension was selected as the intervention focus because of the critical role of inferential thinking in developing proficiency in mathematics. This chapter includes a description of the student and relevant background information. The intervention's relevancy to the Common Core Standards, as well as to the Individuals with Disabilities Education Act (IDEA), is also discussed.

### **Student Background**

The participant in this case study will be addressed by the name "Claude" to protect his privacy. Claude was a Black male, age 7 years 9 months at the time of intervention. According to his Individual Education Plan (IEP), Claude was receiving special education support under the category of Specific Learning Disability (SLD) in the area of mathematics. At the time of intervention, Claude participated in the general education curriculum but received academic support in the special education setting for math.

It should be noted that the initial IEP stated that Claude underwent surgery in 2007 to correct a birth defect in which Claude was given a plastic cranium. His initial IEP indicated that a member of the IEP team spoke with Claude's physician regarding the surgery. The physician

noted that Claude does not have any physical limitations, although some patients undergoing this surgery do experience problems with memory.

According to his special education teacher, Claude also has a medical diagnosis of Attention Deficit Hyperactivity Disorder (ADHD). According to teacher interview, Claude exhibits behaviors described as inattentive, restless, fidgety, and anxious. Claude's mother and his special education teacher stated that Claude takes medication on a daily basis to minimize these behaviors in the classroom setting.

According to his general education and special education teachers, Claude was performing near grade level (late 2<sup>nd</sup> to early 3<sup>rd</sup>) in English-Language Arts. Both stated that he is an accurate reader but struggled with reading comprehension, particularly inferential thinking. In math, Claude was performing at the kindergarten grade level according to his special education teacher and struggled in all areas, including the comprehension of story problems. She stated that she believed Claude benefitted from repetitive tasks such as daily fact practice and flashcards; this was completed in the special education setting per his IEP.

Both his mother and his teacher described Claude as "slow to warm up." However, after becoming comfortable in a situation, his social and emotional functioning was described as age-appropriate. Claude's interests included basketball, animals, and video games.

### **Individuals with Disabilities in Education Act**

The Individuals with Disabilities in Education Act (IDEA), revised in 2004, mandates that individuals with disabilities be provided with services that meet their educational needs. As a part of IDEA, a child with a disability is ensured a free and appropriate education (FAPE) in the least restrictive environment, meaning the child should be involved in the general education



setting and curriculum to the maximum extent possible while still meeting the child's educational needs (U.S. Department of Education). Claude had been found eligible for special education services in the category of Specific Learning Disability (SLD). Claude's IEP specified that he participate in the general education setting and curriculum in all academic areas except for math, in which he received support and modifications to ensure his success with the general education math curriculum.

### **Common Core Standards**

The Common Core Standards, adopted in Wisconsin in 2010, provide a framework for academic instruction for students from grades kindergarten through 12. It is important that all students meet the standards for each grade level for long-term success (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2012). The intervention implemented in this study addressed several elements of the Common Core Standards in the area of literacy. Claude's area of need was making inferences; therefore, this intervention focused on the literacy standards related to reading comprehension.

Specifically, one of the 2<sup>nd</sup> grade literature standard reads, "By the end of the year, read and comprehend literature, including stories and poetry, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range" (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p. 11). Comparably, the 3<sup>rd</sup> grade literature standards states, "By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 2–3 text complexity band independently and proficiently." (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p.12).

While making inferences is not directly referenced in the Common Core Standards until Grade 4, undoubtedly, it is a component of comprehension in grades 2 and 3. Literature, stories, and poetry in the grades 2-3 text complexity band - including those used in this intervention - require inferential thinking for proficient comprehension. Furthermore, comprehension and inferential thinking are also connected to the Common Core Standards in mathematics, particularly those related to solving story problems. For example, one of the second grade standards states, “Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions” (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p.12). In Chapter 2, a more detailed discussion of the research related to the connection between reading comprehension and mathematics is presented.

## **Conclusion**

Federal law mandates that students with disabilities receive individualized support that meets their unique needs and ensures their success in the long-term – whether it is continuing education, vocational skills, or independent living. Claude’s area of need is inferential thinking, which applies to both reading comprehension and mathematical story problems. Thus, a research-based intervention for making inferences was designed and implemented. Relevant research findings, including essential literacy components, the connection between reading comprehension and math, and techniques to improve inference ability, are presented in the next chapter.

## CHAPTER TWO

### Review of Literature

The purpose of this study is to investigate the effect of an inference intervention for a student who has a math disability and struggles with inferential thinking. Research regarding the essential components of literacy - one of which is reading comprehension - is outlined in the first section. The second section documents research regarding the inter-connectedness of reading and mathematics. Finally, the third section presents research that is specific to instruction in making inferences.

#### Essential Literacy Components

Students who are struggling to acquire and maintain foundational literacy skills in elementary school often struggle in one of five crucial areas: phonemic awareness, phonics, fluency, vocabulary, and comprehension. In this section, several research studies are presented that illustrate the importance of each component.

A study by Snider (1997) demonstrated the importance of phonemic awareness as a foundational component of literacy. In this longitudinal study, Snider investigated if phonemic awareness in kindergarten is a predictor (independent variable) of reading achievement in second grade (dependent variable). The sample consisted of 73 kindergarteners with a mean age of 6 years 6 months. The kindergarteners were given an unnamed “Test of Phonemic Awareness,” which had five components: phoneme segmentation, phoneme deletion, phoneme substitution, and rhyme generation, and initial consonant matching (Snider, 1997).

Of the 73 kindergarteners, 50 were tested when these students reached second grade; the 23 other participants had either moved schools or been retained. The second graders were assessed using the Word Analysis and Reading Comprehension subtests on the Iowa Test of Basic Skills (ITBS; Hieronymus, Hoover, & Lindquist, 1986).

The results of this study indicated that although rhyme generation and matching initial consonant sounds did not predict performance on subtests of the ITBS, a significant correlation did exist between performance on the phoneme segmentation, phoneme deletion, and phoneme substitution in kindergarten and scores on the ITBS subtests in second grade.

This study's findings have implications; it indicates that students who are struggling with phonemic awareness in the early school years require intervention, as it can be a predictor of later reading achievement. Furthermore, older readers who are struggling may need remediation in the area of phonemic awareness in order to progress to higher-level reading skills.

While Snider (1997) found phonemic awareness is important for successful literacy skills, Kochnower, Richardson, and DiBenedetto (2001) found that some students with learning disabilities also struggle with phonic decoding of words.

The purpose of a study by Kochnower, Richardson, and DiBenedetto (2001) was to determine whether students with learning disabilities struggled with decoding relative to students without learning disabilities when matched in word recognition ability and IQ. In this study, whether students had a learning disability acted as the independent variable and students' scores on the Decoding Skills Test (DST; Richardson, DiBenedetto, & Adler, 1979) acted as the dependent variable.

The sample consisted of 40 students from a suburban school; 20 of these students, mean age 10.3 years, were labeled as students with learning disabilities. These students had normal to

above average intelligence according to archival data of scores on the Wechsler Intelligence Scale for Children (WISC-R; Wechsler, 1974). The Peabody Picture Vocabulary Test (PPVT; Dunn, 1965) and the DST were administered to determine IQ and reading ability, respectively. Additionally, a group of 20 “normal readers,” mean age 8.02 years, were also selected from the general education population. These students scored average or above average on the California Achievement Test (CAT; Tiegs & Clark, 1977). The “normal readers” were also administered the PPVT and DST and matched to students in the learning disabilities group.

Aside from providing an overall reading level, the DST also measures phonic decoding ability by having students read 60 “real words” representing the most common letter-sound patterns. The test also includes 60 non-sense words where letters in a real word are altered. Correct answers that are provided within 2 seconds are considered “immediate recognition responses;” correct answers provided within 2-10 seconds are counted in the “total correct.” Scores from these two portions of the DST provided the data for both groups of students’ phonic decoding abilities.

The results indicate that the “normal readers” had higher scores on both subtests of the DST. For the number of total correct real words, normal readers outscored readers with learning disabilities (78% and 69% respectively); normal readers also outscored readers with learning disabilities in the total correct nonsense words (62% to 49% respectively). A more marked difference between the two groups existed in both the immediate recognition of real words (71% for normal readers and 57% for readers with learning disabilities) and the immediate recognition of nonsense words (54% for normal readers and 39% for readers with learning disabilities).

As the findings of the study indicate, students with disabilities are more likely to struggle with phonic decoding of words. Similarly, the purpose of a study conducted by Speece and

Ritchey (2005) was to determine which early literacy skills, including phonics ability, are predictors of reading fluency for at-risk readers. Additionally, the authors aimed to determine the typical growth trajectory in the area of fluency of at-risk readers and normal readers.

In the study by Speece and Ritchey (2005), participants' scores in the area of Letter Sound Fluency (LSF; Speece & Case, 2001) and Oral Reading Fluency (ORF; Speece & Case, 2001) at the beginning of first grade acted as the independent variable. The dependent was students' reading fluency at the end of first grade and at the end of second grade.

The sample consisted of 276 first graders from suburban schools in several mid-Atlantic states. Of the participants, 140 were considered "at risk" because they scored in the bottom 25<sup>th</sup> percentile of their class based on a LSF probe. The other participants were considered "not at-risk," having scored in the 30<sup>th</sup>, 75<sup>th</sup>, or 90<sup>th</sup> percentile.

To assess predictors of fluency, participants were assessed weekly or monthly throughout first and second grade using two measures: LSF, a score of number of letter/sounds identified in one minute and ORF, a score indicating the number of words read per minute on a grade-level passage. To assess growth trajectories, students were also assessed using the following measures: Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgensen, Rashotte, 1999), timed naming of familiar objects, and phonological awareness (blending and deletion of sounds). Furthermore, the Test for Word Reading Efficiency (Torgensen, Wagner, & Rashotte, 1999) measured students' speed and accuracy on reading lists of words. The Basic Reading Skills subtest of the Wechsler Intelligence Scale for Children (Wechsler, 1974) provided participants' IQ scores.

As to predictors of reading fluency, the results indicate that LSF in early 1<sup>st</sup> grade is a significant predictor of ORF at the end of 1<sup>st</sup> grade, while neither naming of familiar objects nor

phonological awareness was a significant predictor. However, LSF was not a significant predictor of ORF in 2<sup>nd</sup> grade; rather, ORF at the end of 1<sup>st</sup> grade was the most significant predictor of ORF at the end of 2<sup>nd</sup> grade. As to the typical growth trajectory of fluency for students at-risk, at the end of 1<sup>st</sup> grade, the at-risk readers were reading an average of half as many words per minute and progressing at half the rate of their not at-risk peers. The growth trajectories suggest that reading fluency develops along with early literacy skills rather than following them.

The studies by Snider (1997), Kochnower, Richardson, and DiBenedetto (2001), and Speece and Ritchey (2005) indicate that phonemic awareness, phonic decoding, and fluency are important for early readers and may be predictors of later reading achievement. The results of a study by Hemphill and Tivnan (2008), however, suggest that while phonemic awareness is a strong predictor of reading achievement early on, vocabulary is a stronger predictor in 2<sup>nd</sup> and 3<sup>rd</sup> grade.

The purpose of this study was to determine which components of early literacy (phonological awareness, vocabulary, comprehension) are correlated with reading performance over time, particularly in at-risk populations. Therefore, the independent variable in this study was performance level in early literacy at the beginning of first grade and the dependent was reading comprehension at the end of first, second, or third grade.

The sample for this study consisted of 599 students from Boston elementary schools, the majority of whom were African American or Latino and considered “high poverty.” These students were tested individually at the beginning of first grade using the Peabody Picture Vocabulary Test (PPVT-III; Dunn & Dunn, 1997), the Yopp-Singer Test for Phonemic Awareness (Yopp, 1995), the word identification and word attack subtests of the Woodcock-

Johnson Diagnostic Reading Battery (WDRB; Woodcock, 1997), and the School-Home Early Language and Literacy battery (SHELL; Snow, Tabors, Nicholson & Kurland, 1995). At the end of first grade, the PPVT-III, Yopp-Singer, and WDRB subtests were repeated, along with the comprehension subtest of the Gates-MacGinitie Primary 1 (GMRT-4; MacGinitie, MacGinitie, Maria & Dreyer, 2000).

At the end of second grade, the students again took the PPVT-III, WDRB subtests, and GMRT-4 Primary 2; at the end of third grade, the students took the GMRT-4 Primary 3 for a final time. The results indicated that at the beginning of first grade, students varied in their scores for language and literacy performance; the average student demonstrated above-grade level on letter and word identification subtests of the WDRB but below average vocabulary skills, performing at the 19<sup>th</sup> percentile. While decoding skills at the beginning of first grade were significantly correlated with reading comprehension scores at the end of first grade, the correlation weakened, although remained statistically significant, with reading comprehension scores in 2<sup>nd</sup> and 3<sup>rd</sup> grade. Vocabulary measures in the beginning of first grade, however, had the strongest correlation with reading comprehension at the end of both 2<sup>nd</sup> grade and 3<sup>rd</sup> grade.

The findings of this study suggest that the stronger a student's vocabulary is early on, the more likely the student is to have strong reading comprehension skills later, demonstrating the importance of vocabulary instruction as a vital component in literacy. Other struggling readers, however, may have sufficient knowledge of vocabulary words but instead struggle to adequately retrieve those words from their long-term memory. This idea was supported by a study by Wolf and Segal (1999), in which they investigated the effect of an intervention involving word retrieval, naming speed, and vocabulary depth on children with reading impairments.



The intervention, “Retrieval Rate, Accuracy, and Vocabulary Elaboration” (RAVE) served as the independent variable, while the dependent variable was students’ performance on a battery of tests that assessed word retrieval and vocabulary measures, among them, the Peabody Picture Vocabulary (PPVT; Dunn & Dunn, 1981), Boston Naming Test (BNT; Kaplan, Goodglass & Weintraub, 1983), and Rapid Alternating Stimulus (RAS; Wolf, 1986). General reading skills were also assessed using the Gates-MacGinitie Comprehension Test (Gates & MacGinitie, 1978) and Gray Oral Reading Test (Gray, 1967).

The sample consisted of 24 students with reading impairments from a residential school for students with dyslexia; the students had a mean chronological age of 13 years and were from mixed socioeconomic statuses (SES). Students qualified as having a reading impairment if they were performing 2 to 3 years below their chronological age in reading. Of the group with reading impairments (RI group), 7 students were eliminated from the analysis because of missing data. Finally, 31 students were selected from a parochial school, also from mixed SES, with a mean chronological age of 10 years, to serve as a control group.

Students were pre-tested in the areas of word retrieval, vocabulary, and overall reading, as described above. The students received the RAVE intervention in groups of 4 to 6 as a part of their language arts curriculum. The group met for 30 minutes, 4 times per week, for 2 months. The RAVE method consisted of four basic elements: 1) “Word Sleuth,” a strategy based on the acronym SAM SSSS, in which each letter stands for a method of retrieving words; 2) Vocabulary, in which students studied morphemes and practiced using words in various contexts; 3) Lexile access and retrieval, in which students were taught to use visual imagery as a method of making new words accessible; 4) Retrieval Rate, in which students participated in word games, such as generating synonyms.

The results of the pre-test indicated that the control group did significantly better on the assessments that measured naming retrieval and speed tests, as well as two measures of vocabulary, despite them having a mean age three years younger than the RI group. A significant difference between the RI and control group in receptive vocabulary, as assessed by the PPVT, was not found. The post-test data indicated that after undergoing the RAVE intervention, the RI group made significant progress on word retrieval (increase in scores on the RAS) and vocabulary depth (increase in scores on the BNT).

The findings of this study provide important implications for further research. The RI group did not have a significant difference in receptive vocabulary compared to the control group, but did, indeed, have significant differences in speed of retrieval, providing an important consideration for intervention. An under-performing reader may indeed have the *knowledge* of vocabulary words but struggle to access the word in the working memory. In these cases, he or she may require an intervention that targets retrieving these words from memory, rather than extending receptive vocabulary in itself.

Certainly, some readers may struggle to be fluent readers; others, however, have strong decoding skills and read quickly and accurately. However, as a study by Applegate, Applegate, and Modla (2009) found, although a student may *appear* to be a good reader because he or she reads fluently, he or she may not be fully grasping the meaning of the text.

In their study, Applegate, Applegate and Modla (2009) aimed to support the idea that highly fluent readers will also be skilled comprehenders and secondly, that highly fluent readers are particularly skilled in comprehension that requires critical thinking. The independent variable, in this case, was fluent reading, while reading comprehension served as the dependent variable.

The sample in this study included 171 children in grades 2 through 10 from Pennsylvania, New Jersey, and Delaware, each of whom had been identified by a teacher or parent as being a skilled reader. The majority of the students were white (86%) and attended public schools (89%).

Each student was assessed using the Critical Reading Inventory-2 (CRI-2; Applegate, Quinn, & Applegate, 2008) at his or her grade level. The CRI-2 consists of a narrative or informational passage (from the pre-primer to 12<sup>th</sup> grade level), a retelling rubric, a fluency rubric, and text-based, inference, and critical response questions. The student read one passage orally and a second passage silently; for each passage, the student provided a retelling and then answered 10 comprehension questions (8 text-based and 2 inference/critical response questions).

Students' scores on the comprehension portion of the assessments were divided into three categories: students receiving a score of 85% or higher were considered to be advanced comprehenders; those scoring between 63% and 80% were considered proficient comprehenders; those scoring 58% or below were considered struggling comprehenders. While 30% of the students in the sample scored in the advanced comprehender range, 36% scored at the proficient level. Despite being fluent readers, however, 33% of the students fell into the category of struggling comprehenders.

Furthermore, the data suggest that the struggling comprehenders' weakness was not in text-based comprehension questions, but in higher-level comprehension questions, such as inferencing and critical response questions. This study suggests, then, that it is important for educators to consider all areas of literacy when addressing students' needs. On the surface, it may seem that a student is successful because he or she can read with speed and accuracy.

However, it is evident that some of these students may not be achieving an adequate level of understanding to fully grasp meaning.

Clearly, research suggests that successful literacy skills incorporate all five components of phonemic awareness, phonics, vocabulary, and comprehension. Phonemic awareness, phonics, and fluency are important foundational literacy skills and are significant predictors of reading success in elementary school (Snider, 1997; Kochnower, Richardson, & DiBenedetto, 2001; Speece & Ritchey, 2005). Furthermore, vocabulary and comprehension allow students to create meaning from reading (Hemphill & Tivnan, 2008; Applegate, Applegate & Modla, 2009). Students who miss or do not fully grasp one or more of these essential components early in the schooling experience may experience struggles in literacy long-term.

### **The Relation between Reading Comprehension and Mathematics**

Although the content of mathematics is generally considered as consisting of numbers, shapes, and equations, literacy is a fundamental part of mathematics. The following studies demonstrate how reading comprehension and critical thinking skills are keys for success in mathematics.

Sovik, Frostrad, and Heggberget (1999) studied the relation between reading comprehension and strategies used to solve word problems in math. The researchers hypothesized that students who are both good at arithmetic and reading use deductive strategies more often than students weaker in one or both areas. Secondly, they hypothesized that IQ is a better predictor of deductive strategy use, rather than reading comprehension skills.

The sample consisted of 4<sup>th</sup> graders from a large city in Norway. Five students were selected for each of the following groups: students who are above average in both math and

reading (Group 1); students who are above average in math but below average in reading (Group 2); students who are below average in math but above average in reading (Group 3); students who are below average in both math and reading (Group 4). Students were placed in groups based on teacher rating, as well as performance on achievement tests. The achievement tests included Gjessing's 1973 Reading Test, in which students read texts and answered questions; this test has not been standardized. Additionally, a standardized test of achievement in math by Tornes, Rusten, and Hagen (1977) was used, as well as a battery of subtests from the Wechsler Intelligence Test for Children, standardized for children in Norway by Undheim in 1974 (Sovik, Frostrad, & Heggberget, 1999).

The students in the sample took 3 math tests, each of which consisted of 6 written word problems. Test 1 was based on addition, Test 2 on subtraction, and Test 3 on multiplication and division. These tests were administered one-on-one for the purpose of determining which strategies students used most often in solving arithmetic problems. The strategies that students employed were then classified as being deductive (based on retrieval) or procedural (based on counting, i.e., using fingers to count up or down from an addend). Finally, the researchers completed a regression analysis to determine the significance of reading comprehension and IQ as predictors of math strategies.

The results indicate that students in Group 1 and 2 (students who are above average in both math and reading and students who are above average in math but below average in reading) used deductive reasoning more than the students in Group 3 and 4. The strategies of students in Group 2, who were less skilled in reading, did not seem to be affected on Test 1 and 2 (addition and subtraction) compared to Group 1; however, the strategies did seem affected on

Test 3 (multiplication and division). Therefore, the researchers concluded that further research needs to be completed in the area of “strategy use” before a conclusion is reached.

The results of meta-analyses, however, indicate that reading comprehension is related to both strategy use and mathematical processes; that is, as reading comprehension increases, the use of deductive strategies and general mathematical skills increase. Despite the relationship, however, IQ was a more significant predictor for the use of deductive strategies and mathematical skills compared to reading comprehension.

Another study by Bilsky, Blachman, Chi, Mui, and Winter (1986) had similar findings with regard to deductive reasoning and inferential thinking in math. The aim of this study was to investigate if students’ inferential thinking (dependent variable) was different when math problems were presented in a math problem format versus in a story format (independent variable).

The sample in this study consisted of 72 students from New Jersey Public Schools. Half of the students ( $n = 36$ ), mean age 15.07 years, were identified as having a disability; according to the Wechsler Intelligence Scale for Children – Revised (Wechsler, 1974) the students had an average “mental age” of 11.13 years. The other half of the students ( $n = 36$ ), mean age 10.36 years, had an average mental age of 11.33 years.

Participants were presented with “problem stories,” developed by the researchers. Problem stories contained elements of a math problem in that quantitative relationships were present (i.e, simple addition or subtraction); however, they also had elements of a story such as a plot and short sequence of events (e.g., Joe went to the zoo and fed 5 monkeys and 3 elephants...). Before reading the problem stories, however, students were presented with one of three conditions: 1) listen very carefully to the story but ignore the numbers (story set); 2) listen

very carefully for the numbers (math set); 3) listen very carefully to the sentences (neutral set). Following the problem stories, participants answered inference questions – both quantitative and qualitative – as well as true/false fact statements. The inference questions assessed students' ability to add or subtract numbers in the story (quantitative) and add, delete, or elaborate on pertinent information in the story (qualitative).

As the researchers expected, the results indicated that the students without disabilities answered more questions correctly. All subjects performed better on fact-based questions than inference-based questions. Finally, students in the story and neutral set performed better on qualitative inferences than did students in the math set. Interestingly, there was no relationship between the set (math, story, or neutral) and students' quantitative inferences. It is apparent, then, that students' perceptions of story problems, perceived as a math problem or as a story with numbers embedded, does affect students' performance, particularly on inferential thinking.

The aforementioned studies provide important insight for the design and implementation of interventions for students who are under-performing in math and/or reading. The highest performing students in the study by Sovik, Frostrad, and Heggberget (1999) employed deductive reasoning; furthermore, the study by Bilsky, Blachman, Chi, Mui, and Winter (1986) found that students' approach to problem solving varied with respect to a "reading" or "math" mindset. It is without a doubt, however, that reading comprehension and math are interconnected. For struggling students, targeting reading comprehension may increase achievement in math.

### **Reading Comprehension and Attention Deficit Hyperactive Disorder**

In recent years, there has been an increase in awareness on Attention Deficit Hyperactivity Disorder (ADHD). According to the Diagnostic and Statistical Manual (DSM)

criteria, a child may be diagnosed with ADHD if symptoms of inattention, hyperactivity, and impulsivity manifest before the age of 12 and interfere with functioning in at least two settings (American Psychiatric Association, 2012). In the educational setting, then, it is well known that children with ADHD often struggle with academics, particularly in the area of literacy.

A study by Berthiaume, Lorch, and Milich (2010), had two purposes: first, to investigate how children with Attention Deficit Hyperactivity Disorder (ADHD) formulate inferences and second, to investigate how children with ADHD monitor their comprehension of a story. In this study, the independent variable was ADHD and the dependent variable was students' ability to generate inferences and/or monitor understanding of text.

As ADHD is more prevalent in boys than girls, only boys were included in the sample population for this study. These boys were recruited from a longitudinal study that began 3 years before; to qualify for the original study, the boys had to have a diagnosis of ADHD by a child psychiatrist, fit a "profile" of ADHD upon review of records, and have a confirmed ADHD diagnosis via a parent interview procedure. Boys without ADHD were also included as a comparison group; they were recruited for the longitudinal study via a newspaper advertisement and were determined to be without learning or behavioral abnormalities according to a parent rating scale.

Of the boys from the longitudinal study, the boys (both ADHD and comparison) participating in the study by Berthiaume, Lorchwith, and Milich (2010), were required to have a vocabulary score above 6 on the WISC-III or WPPSI-R (Wechsler, 1999; Wechsler, 1991) and be between 7 and 12 years old. Of the boys who qualified, 28 boys with ADHD and 39 comparison boys agreed to participate. The mean age overall was 9.96 years; 90% of sample was Caucasian and 10% African American.



The boys worked individually with a researcher to complete three tasks. The first task consisted of items in which the first sentence contained an ambiguous word (e.g., Joe played a sport) and one, two, or three clues to inform the ambiguous word. Each boy was asked what the ambiguous word meant and then asked to show his confidence in his answer on a three-point scale. For the second task, each boy was presented with a six short stories describing an animal. Three of the stories were consistent and three were inconsistent; inconsistent stories included a phrase that contradicted something stated earlier in the story. After the boy heard each story read out loud, he was asked if anything sounded mixed up and if so, what was inconsistent.

In the final task, each boy was read four short stories in which inferences were necessary for understanding the main point. The boy was then asked to tell everything he was thinking about the story. If the boy did not start talking within 5 seconds, simply retold the events, or made comments unrelated to the story, the examiner provided a prompt. Each boy's comments were then coded according to correctness and/or plausibility.

The results of this study show that as a group, the boys with ADHD had lower vocabulary scores than the comparison group. The results of each task were also compared. For the first task, which provided one to three clues, the percentage of correct inferences was calculated. While the boys with ADHD and the boys in the comparison group who had vocabulary scores below the median did not differ, the boys with ADHD who had a vocabulary score above the median scored significantly lower than boys in the comparison group with similar scores. Furthermore, the confidence of the boys in the comparison group increased linearly with the number of clues given, while there was no difference in the confidence of boys with ADHD between one and two clues but a significant increase in confidence with three clues.

With regards to the task where inconsistent information was sometimes provided in short stories, boys with ADHD performed more poorly overall. While there was no difference between the two groups in identifying stories with consistent information, the boys with ADHD had significantly lower scores in identifying the inconsistent information. The boys with ADHD had a mean score of 27.4% while the boys in the comparison group had a mean score of 58.2%.

In the final task, boys in both the ADHD and comparison group made the same number of statements when completing the think-aloud. Similarly, the groups did not differ significantly in the number of correct or plausible inferences. However, the boys with ADHD made significantly more incorrect or implausible inferences.

The results of the study by Berthiaume, Lorch, and Milich (2010) provide significant insight into the implications of ADHD on students' functioning in literacy. It is apparent that boys with ADHD may need additional support in the area of reading comprehension and may benefit from alternative methods of teaching inferential thinking.

### **Designing an Inference-Based Intervention**

In literacy, students may be able to rhyme, decode multisyllabic words, and read fluently. However, without the ability to comprehend text, students cannot find meaning in what they are reading. Some readers even demonstrate “surface” comprehension - retell a story and recall facts – but many, particularly those with disabilities, struggle with fully grasping, evaluating, and extending text. Much of these higher-level comprehension skills require inferential thinking. As the following research indicates, increasing a student's ability to make inferences results in improved reading comprehension.

Mcgee and Johnson (2003) studied the impact of inference training on skilled and less skilled readers. The independent variable in this study was inference training, as described below. The dependent variable was the students' scores on the Neale Analysis of Reading Ability (NARA; Neale, 1989), an assessment tool that measures reading accuracy and comprehension.

The sample consisted of 40 children, ages 6 years 6 months to 9 years 11 months, whose first language is English. Based on the students' NARA scores, 20 students were defined as low comprehenders. These students' accuracy scores on the NARA were comparable with their age but their comprehension scores fell six months or more below their age and reading accuracy scores. The other 20 students were identified as skilled comprehenders; these students' comprehension scores on the NARA were equal or above their ages and accuracy scores.

The 40 students were then split into two equal groups of mixed abilities and randomly assigned to inference training or standard comprehension exercises. Students worked in groups of 5, in a quiet area of a school, 2 times per week, for 3 weeks. The students who received inference training received three components of training, including inferring the meaning of unknown words using clue words, generating questions using wh- questions, and predicting what's hidden when a sentence is obscured in a passage. The comprehension group read a passage and answered questions "in strict rotation" (McGee & Johnson, 2003, p. 53).

The results of this study indicated that both interventions (i.e., inference training and standard comprehension exercises) improved the comprehension scores of all participants, but the scores of the less skilled comprehenders (mean growth was 15 months) increased more than the skilled comprehenders (mean growth was 9 months). Furthermore, both low and high comprehenders who received inference training increased an average of six months more than

the students who received standard comprehension exercises. The less skilled comprehenders who received inference training, however, made the most gains, gaining an average of 20 months from pre- to post-NARA test.

The findings of this study are important, as they show that the ability to make inferences is not necessarily innate and can be improved by explicitly teaching students to find clue words in a text and predict meanings of hidden words and sentences. While the findings of McGee and Johnson (2003) pertain to the effects of an inference intervention on late-elementary students, Fritschmann, Deshler, and Schumaker (2007) found that a similar inference strategy is also effective with older struggling readers.

In their study, the independent variable was an inference strategy using the mnemonic device “INFER” (Fritschmann, Deshler, & Schumaker, 2007). The dependent variable was a strategy-use test, in which students received a score for demonstrating use of each step of the strategy on a ninth grade passage; a criterion-based comprehension test, in which students read a passage and answered factual and inference-based questions; a strategy knowledge test which assessed students’ understanding of the inference strategy; and the Group Reading Assessment and Diagnostic Evaluation (GRADE; Williams, 2001).

The sample consisted of eight students in 9<sup>th</sup> grade in an urban midwestern public school district. According to the GRADE, these students scored at least 5 grade levels below their current grade (9<sup>th</sup>) and had been labeled with learning disabilities according to the district’s IQ-achievement discrepancy model. Led by the researchers, the students received instruction in the inference strategy in groups of 4. Each session lasted 60 to 75 minutes.

Using the mnemonic device INFER, the students were taught five steps to employ. The students were taught to first “interact with the passage” by previewing the passage and questions

and categorizing the questions as “factual” or “think and search” (inference). The next step, “note what you know,” required students to activate background knowledge. Then, students needed to “find the clues” by underlining details that relate the keywords in the questions. The fourth step, “explore more details,” regarded looking for any additional clues in the passage to support an answer. Finally, students “return to the question” and choose answers. The INFER method was initially taught via modeling; students practiced the method using passages which varied in instructional level from 4<sup>th</sup> to 8<sup>th</sup> grade.

The results indicated that the number of comprehension questions that students answered correctly increased during instruction and in the post-test measures, with an average increase of 50.26%. Similarly, on average, students scored 81.94% on the strategy use test following the intervention. Finally, according to results of the standardized reading test, students grew an average of 2.82 grade levels from pre- to post-intervention, demonstrating significant important in reading comprehension.

Although the study by Fritschmann, Deshler, and Schumaker (2007) suggests that their INFER method is an effective intervention for 9<sup>th</sup> graders with learning disabilities, younger students may require starting with a simpler strategy as a way of scaffolding to more involved strategies, such as the INFER method. In the following study, Dewitz, Carr, and Patberg (1987) investigate using a cloze strategy to teach inferences.

In this study, the treatments (independent variables) included a cloze strategy, a structured overview, a combination of cloze strategy and structured overview, and a control group. The participants’ scores on researcher-developed comprehension tests (including both factual, text-based questions as well as inference-based questions) for social studies passages acted as the dependent variable.

The sample included 101 students in 5<sup>th</sup> grade who were of high, middle, or low-abilities according to the Iowa Test of Basic Skills (ITBS; 1978). The students were divided into four classes and received one of four treatments. The group receiving the cloze treatment was taught to use background knowledge and clues before and after the blank to infer a word which might fit; after the teacher inquired how and why students provided certain words, he or she explained why some answers were correct. The students progressed to using this method for paragraphs and then passages and finally, to answering inferential questions regarding the passages. They were also taught to ask themselves questions as a way to self-monitor, such as, “Does the answer make sense?”

The second group received a “structured overview” treatment, in which the teacher showed a conceptual diagram and pertinent vocabulary words of all of the material to be covered. The students reviewed this diagram daily; they read the same passages as the cloze group but without cloze sentences. The third group received a combination of the cloze and structured overview treatment. The fourth group acted as a control group; these students read the same passages and worked on map skills.

The results indicated that no differences existed between the four groups on the first comprehension assessment. However, the results of the 2<sup>nd</sup> and 3<sup>rd</sup> comprehension assessments indicate that the students in the cloze and combination of cloze/structured overview groups achieved better comprehension scores on both text-based and inference-based questions relative to the other two groups. Furthermore, the students who received the cloze intervention were better able to explain their reasoning relative to the other groups.

The findings of the studies presented in this section show that interventions designed to teach students to make inferences improves students’ overall reading comprehension for students

of all ages (McGee & Johnson, 2003; Fritschmann, Deshler, & Schumaker, 2007). While older students benefit from using mnemonic devices such as “INFER” to remember five main steps of inferring, teaching inferences using cloze sentences may be a starting point for younger students (Fritschmann, Deshler, & Schumaker, 2007; Dewitz, Carr, & Patberg, 1987). By introducing and practicing inferring using cloze sentences and then progressing to reading paragraphs and passages, the skill may be appropriately scaffolded to ensure success.

## **Conclusion**

As research indicates, to be successful it is crucial that students receive comprehensive literacy instruction including the components of phonemic awareness, phonics, fluency, vocabulary, and comprehension. It is also apparent that students who are at-risk for reading failure and identified as having learning disabilities may struggle in one or more specific areas. Phonemic awareness - including rhyme generation, segmenting, adding, deleting, and substituting sounds in words – is often considered the beginning steps to literacy and is predictive of later reading achievement (Snider, 1997). However, it is evident that phonic decoding is also a crucial component of early literacy skills and is of particular importance for struggling readers (Kochnowar, Richardson, & DiBenedetto, 2001). At the same time, the study by Speece and Ritchey (2005) indicates that developing both letter-sound and word fluency concurrent with early literacy skills is important.

While phonemic awareness, phonics, and fluency appear to be important as foundational literacy skills, vocabulary appears the most significant predictor of longer-term reading success (Hemphill and Tivnan, 2008). Some students, however, may need an intervention that targets the access and retrieval of vocabulary (Wolf & Segal, 1997). Finally, reading comprehension is

of crucial importance, both in text-based recall and in critical response. Both struggling readers and seemingly “normal” readers may struggle to understand the text even if they appear to be fluent readers (Applegate, Applegate & Modla, 2009).

As a whole, these studies demonstrate the importance of taking the needs of individual students into account when designing interventions. When considering a struggling student, each component of literacy needs to be fully assessed, as each is a vital piece of the literacy puzzle. If even one of the components is underdeveloped, it is clear that overall, long-term reading success may be at risk.

While students’ - and even some educators’ - may view literacy and math as very different entities, research indicates that reading comprehension is an important component of mathematics. In general, students who are more skilled in reading comprehension are more likely to use deductive strategies, which has been found to be related to higher overall math achievement (Sovik, Frostrad, & Heggberget, 1999). More specifically, reading comprehension is particularly important for written story problems, although students’ approaches differ when problems are presented as a math problem versus as a story (Bilsky, Blachman, Chi, Mui, & Winter, 1986). Therefore, an effective intervention for a student who struggles in both reading comprehension and math should target both reading comprehension and deductive reasoning and make apparent the inter-connectedness of math and literacy.

Finally, research indicates that interventions that provide strategies and instruction in making inferences are effective in increasing the reading comprehension of all ages of struggling readers and may be of particular importance for students with diagnoses of ADHD (Berthiaume, Lorch, & Milich, 2010). In particular, interventions that target making inferences at a sentence level, such as inferring missing words in a sentence, may be particularly effective for elementary



students (McGee & Johnson, 2003; Dewitz, Carr, & Patberg, 1987). However, it also clear that explicitly teaching the steps in making inferences is important. The interventions included in the studies had common steps, including activating background knowledge, looking for textual clues, and encouraging students' to use metacognitive strategies such as explaining their thinking (McGee & Johnson, 2003; Dewitz, Carr, & Patberg, 1987; Fritschmann, Deshler, & Schumaker, 2007).

## CHAPTER 3

### Procedures

In this chapter, a description of the student who participated in this study is provided. The intervention, which was designed and implemented based on this student's needs, is outlined, as well as the data that were collected to measure overall effectiveness of the intervention.

### Sample Population

The participant in this case study was a Black male, age 7 years 9 months, who was entering 3<sup>rd</sup> grade. The participant will be identified by the pseudonym "Claude" to protect his privacy. According to his cumulative folder, at the time of intervention, Claude had attended the same school since kindergarten, a public charter school in a large, urban city in the Midwest. The school serves approximately 240 students in grades K4 through 8. Demographically, approximately 83% of students are black; 63% are considered economically disadvantaged (Wisconsin Information Network for Successful Schools, Department of Public Instruction).

An initial Individual Education Plan (IEP) dated December 21, 2010, indicated that Claude was found eligible for special education services in the category of Specific Learning Disability (SLD). At the time of intervention, Claude participated in the general education curriculum but received academic support in the special education setting for math 30 minutes per day with a frequency of 4 times per week.

The initial IEP indicated that the Woodcock Johnson-III Test of Cognitive Abilities was administered in December 2010 (Woodcock, McGrew, & Mather, 2001). Claude's General

Intellectual Ability (GIA) score fell into the average range compared to norms established for same grade, same aged peers. His scores indicated that his relative strength was long-term retrieval, in which he scored in the superior range. His scores indicated that his relative weakness was his verbal ability, including acquired knowledge and language comprehension. In his report, the psychologist who administered the test noted that Claude's language was occasionally off-topic and tangential, although Claude did not qualify for speech and language services at the time of evaluation.

It should be noted that the initial IEP stated that Claude underwent surgery in 2007 to correct a birth defect in which Claude was given a plastic cranium. The IEP indicated that a member of the IEP team spoke with Claude's physician regarding the surgery. The physician noted that Claude does not have any physical limitations, although some patients undergoing this surgery do have problems with memory.

According to his special education teacher, Claude has a medical diagnosis of Attention-Deficit Hyperactivity Disorder (ADHD). However, ADHD was not identified as a Special Education disability at the time of the most recent IEP. His teacher stated that during instruction, ADHD behavior patterns manifested as Claude being inattentive, restless, fidgety, and anxious; however, he was taking an unspecified medication for ADHD on a daily basis and that the behaviors were well managed with this medication. In separate interviews, both his special education teacher and his mother reported that Claude benefits from frequent breaks during instruction.

According to his general education and special education teachers, at the time of intervention Claude was performing near grade level (late 2<sup>nd</sup> to early 3<sup>rd</sup>) in English-Language Arts. Assessments administered by his special education teacher showed that Claude was at

Level K in Fountas and Pinnell, a reading program that utilizes ongoing assessment, leveled books, and guided reading to provide appropriate instruction per ability level (Fountas & Pinnell, 2007). According to Claude's IEP and teacher interview, Claude's relative strength was phonemic awareness and phonics, demonstrating strong decoding skills. His relative weakness, however, was reading comprehension, particularly higher-level comprehension beyond recall of facts, such as making inferences and making connections between text and self. Both Claude's special education teacher and regular education teacher felt that support to remain at the late 2<sup>nd</sup> grade reading level over the summer was important for Claude's success in the next school year.

In math, Claude was performing at the kindergarten grade level, according to his special education teacher. This teacher stated that all areas of math are a struggle for him, including computation, algebraic relationships, geometry, statistics and probability, and measurement. His special education teacher felt that Claude's ability to retrieve information varies; he occasionally forgot something he had been practicing for weeks, but the next day he remembered. Thus, he benefitted from frequent repetition, such as daily fact practice and flashcards.

Finally, Claude's ability to process new information was described as "slower than his peers," according to his special education teacher. Therefore, she felt that Claude benefitted from working in small groups, particularly for the introduction of new material, to minimize the possibility of feeling overwhelmed. Furthermore, she described Claude as "slow to warm-up" to both peers and adults; after he is comfortable, however, his social and emotional functioning was described as age-appropriate. Both his general education teacher and special education stated that Claude is a hard-worker, but works best when provided with prompts and high expectations.

### **Description of Procedures**

To address Claude's literacy needs, an intervention was designed and implemented to increase his ability to make inferences. The intervention was implemented in a one-on-one manner during one-hour sessions. Claude was present for a total of 13 sessions. The first and last sessions were used for pre- and post-assessment. Intervention procedures were conducted for a total of 11 sessions.

Aside from the first and last session, the intervention sessions followed a similar routine. Claude began with a "warm-up" activity, which was an engaging word work activity, such as a game about synonyms. Next, Claude completed a cloze activity in which he inferred missing words or phrases. The text – selected and pre-sectioned by the researcher so that it would take approximately 15 to 20 minutes - was read orally by the student for approximately 10 minutes and then partner read by the researcher and student for approximately 10 minutes. While reading, the student inferred phrases sentences that were obscured in the text (approximately 3 per reading section). The reading was followed by comprehension questions; both explicit (to ensure the student was paying attention) and implicit questions (to practice the inference strategy) were included.

In the second session, Claude was taught the following strategy: "background knowledge + clues in the text = inference." This strategy was taught using a graphic organizer, shown in Appendix B, which was on the table in front of the student throughout the intervention sessions. The researcher completed think-alouds by pointing to each box and explaining her thinking when generating an inference. In the third and fourth sessions, the researcher cued Claude to point at each box and explain orally what he'd put in the box. Initially, picture books at his independent level were used to introduce the concept for the purpose of making the strategy very clear. In the

fourth and fifth session, texts at his instructional level (Leveled K-M according to Fountas and Pinnell) were used (see Appendix A for an annotated bibliography).

The inference strategy was applied in three ways: inferring a missing word in a cloze sentence, inferring an obscured sentence in a paragraph, and answering implicit questions about a passage. At the beginning of the intervention, the student practiced inferring missing words in independent cloze sentences, written by the researcher. For instance, in the sentence, “The boy \_\_\_\_\_ on the ice and bumped his head,” the student was taught to employ background knowledge (i.e., ice is cold, wet, slippery) as well as look for clues in the text (i.e., the boy bumped his head) to insert a logical word (i.e., slipped, fell, tripped). Gradually, the strategy was applied to words obscured within passages and texts.

A similar method was used for inferring obscured phrases or sentences in the daily text selection. Ahead of time, the researcher selected, obscured, and presented sentences in passages in which background knowledge and clues could be employed to infer the meaning of the sentence. For example, in *Nate the Great*, the following was presented: “ ‘I lost a picture,’ she said. ‘ \_\_\_\_\_?’ ‘Of course,’ I said,” (Sharmart, 1972, page 9). Employing the strategy, the student would find pertinent clues (e.g., a picture is lost; Nate responds with “of course”); as well as apply background knowledge (e.g., usually when I lose something, I try to find it), to infer the meaning of the sentence (e.g., I will help find it).

Approximately 25% of the intervention period was spent completing inferences at the sentence and paragraph level. The student spent the remainder of the time answering comprehension questions that required inferential thinking. The inferential thinking strategy was emphasized so that the student would be practicing the format (reading text and answering questions) that is most common during regular instruction and on assessments. The researcher

developed implicit questions based on a passage or text; a question was deemed appropriate to the intervention if both background knowledge and clues in the text could be used to form an inference. For instance, in the text *Howie Boyles, Secret Agent*, the main character, Howie, is moving (Banks, 1999). The author does not explicitly state how Howie feels about going to a new school, but both background knowledge (i.e., if you go to a new school, you won't know anyone) as well as clues from the text (i.e., Howie wondered about who he would be friends with and if they would like baseball) implies that Howie is nervous about going to a new school (Banks, 1999). Thus, the student was asked, "How does Howie feel about going to a new school? How do you know?" Once per week, the student provided a written response to one of these inferential questions.

### **Data Collection**

To measure the effectiveness of this intervention, data were collected using several methods. The Qualitative Reading Inventory-5 was used as a pre-test and post-test to measure overall reading (QRI-5; Leslie and Caldwell, 2011). The QRI-5 provided a measure of Claude's abilities in the area of word identification, accuracy, reading rate, and comprehension. To measure word identification, the student read lists of leveled words. The student then orally read a passage while the researcher recorded miscues (for accuracy) and time elapsed (for rate). Finally, 4 explicit and 2 implicit questions measured the student's comprehension of the passage.

The student was also given an informal inference assessment, developed by the researcher, at the time of the pre-test and the post-test. The student was presented with three pictures in which background knowledge and clues could be used to make inferences about what was occurring in the picture. A 3-point scale was used to score the student's answers;

1 point was given for a correct and/or plausible inference,

1 point was given for evidence of background knowledge in the explanation, and

1 point was given for evidence of clues in the picture being used.

Data were also collected to assess inference skill during the implementation of the intervention. Once per week (3 times total), the session was audio recorded for the purpose of determining: the percentage of opportunities in which the student correctly inferred a missing word or phrase in a cloze sentence, the percentage of instances in which the student inferred the meaning of an obscured phrase or sentence in a passage, and the percentage of correct responses to implicit questions.

## **Conclusion**

Teacher interview, assessment, and historical data indicated that Claude, the student in this study, would benefit from an intervention to improve his ability to make inferences. The intervention procedures, based on current research, were designed to meet his individual needs. The procedures provided scaffolding by including activities to make inferences at the sentence, paragraph, and passage level. The student's progress was assessed using the QRI-5, an informal inference assessment, and audio recordings during the intervention sessions. In the next chapter, the results from these data collection procedures are outlined.



## CHAPTER 4

### Results

The purpose of this study was to investigate the effects of a repeated intervention designed to increase a student's ability to make inferences. The intervention procedures consisted of three activities, including inferring missing words in cloze sentences, inferring an obscured sentence in a paragraph, and answering implicit comprehension questions about a passage. In this chapter, data collected from assessments administered pre-intervention and post-intervention, as well as during the course of the intervention, are presented.

First, the results of the Qualitative Reading Inventory-5 (QRI-5; Leslie & Caldwell, 2011) are presented. These data evidence Claude's overall reading ability, accuracy, and comprehension prior to beginning the intervention. Additionally, data from an informal inference assessment are included. Data collected during the intervention (Session 3; Session 8; Session 12) show how Claude's inferences changed over time. Finally, post-intervention results of the QRI-5 and the informal inference assessment are presented.

#### **Pre-Intervention Results of the QRI-5**

To establish overall reading ability, accuracy, and comprehension prior to the intervention, the QRI-5 was administered during the first session. To establish an accurate reading level – and so Claude could first experience some success - Claude was presented with the word list at the pre-primer 1 level. On this list, he identified 100% of words accurately and

automatically<sup>1</sup>. He was then presented with the pre-primer 2/3 word list; on this list, he identified 100% of words correctly; 90% of them were identified automatically. Thus, he performed at the “independent level” at the pre-primer level.

As Table 4.1 illustrates, Claude performed at the independent level on the primer and first grade word identification lists as well, identifying 90% and 100% of words correctly, respectively. However, when presented with the second grade word list, Claude performed at the instructional level, identifying 85% of words correctly overall. Of the words Claude missed on each list, Claude most often to made structural miscues; that is, he often said a word that *looked* similar to the written word, such as “leave” for the word “live.”

Table 4.1: Pre-Intervention Results of QRI-5 Word Identification

Level	Percent Total Correct Automatic	Total Correct Overall	Level
Pre-Primer 1	100%	100%	Independent
Pre-Primer 2/3	90%	100%	Independent
Primer	95%	95%	Independent
First	90%	100%	Independent
Second	75%	85%	Instructional

The word identification list provided a starting point for the narrative portion of the QRI-5. Claude began with the Level One narrative “The Surprise.” As Table 4.2 indicates, Claude scored 55% on the prediction task, signifying that he was unfamiliar with the topics, which included “puppy, animal care center, and birthday” (Leslie & Caldwell, 2011, p. 188). However,

---

<sup>1</sup> **Automatic:** identifying a word correctly within 1 second (Leslie & Caldwell, 2011, p. 41)

he only had 2 miscues throughout the narrative, indicating that he performed at the independent level in the area of accuracy.

Perhaps of most interest, however, are the results of the comprehension portion of the QRI-5. For the story “The Surprise,” results indicate that Claude retold 17 out of 44 possible events for the story. This narrative also included 6 comprehension questions, 4 of which were explicit<sup>2</sup> and 2 of which were implicit<sup>3</sup>. Claude answered 3 out of 4 (75%) of explicit questions correctly. He answered 1 out of 2 (50%) of implicit questions correctly. Claude’s scores indicate that he is at the instructional level for reading comprehension.

Although Claude scored in the independent range for word identification, demonstrating 99% accuracy, his lower comprehension scores indicate that overall, Claude’s instructional reading level is Level One on the QRI-5 (Caldwell & Leslie, 2011, p. 58).

---

<sup>2</sup> **Explicit:** answers stated directly in the text (Leslie & Caldwell, 2011, p. 75)

<sup>3</sup> **Implicit:** answers in which the reader must infer using clues in the passage (Leslie & Caldwell, 2011, p. 75)

Table 4.2: Results of QRI-5, Pre-Intervention

<b>QRI-5 Measure</b>	<b>Claude's Results</b>	<b>Comments</b>
<b>Level / Title</b>	Level One "The Surprise" (narrative)	
<b>Prediction Task</b>	55% <i>unfamiliar</i>	
<b>Accuracy</b>	99% <i>independent</i>	2 miscues - both mean changing
<b>Rate</b>	57 wpm	Range for Oral Reading Rate at student's instructional level for Level One is 37-77 wpm
<b>Retelling Task</b>	17 events recalled (38%)	
<b>Comprehension</b>		
<b>Explicit</b>	75%	
<b>Implicit</b>	50%	
<b>Overall</b>	66% <i>instructional</i>	

### **Pre-Intervention Results of Informal Inference Assessment**

An informal measure of inference ability was administered during the first session to establish baseline data. Claude was presented with three pictures selected by the researcher. For each picture, Claude was asked to describe what was happening in the picture and then explain his thinking by responding to the question, "Why do you think that?" or "How do you know?" As table 4.3 indicates, Claude's made a plausible inference in one out of three opportunities. For the second picture, half of a point was awarded because Claude response

references the fact that the boy in the picture is injured. As the table indicates, Claude was asked to provide an explanation of why he came to that conclusion. The purpose of this was to look for evidence of Claude using clues in the pictures and/or background knowledge, which was a key element of the intervention strategy. On this task, Claude scored half of a point out of a total of 6 points. Claude's responses did not reference clues in the picture, such as the baby spitting out the food or the basketball player smiling and cheering. Additionally, Claude did not appear to use background knowledge, such as stating, "Why I get hurt, I feel sad" to justify his answers. Overall, Claude scored 22% on the informal assessment prior to beginning the intervention.

Table 4.3: Pre-Intervention Results of Informal Inference Assessment

<b>Description of Picture</b>	<b>Claude's inference</b> (What is happening in this picture?)	<b>Plausible inference</b>  <b>1 POINT</b>	<b>Claude's justification</b> (How do you know that? What makes you think that?)	<b>Plausible explanation</b> Background Knowledge and Clues  <b>2 POINTS</b>	<b>TOTAL POINTS</b>  <b>OUT OF 3 POINTS</b>
<b>Picture 1:</b> Baby being fed green baby food. Baby is spitting out the food.	"The baby is crying."	0	"The baby is hungry."	0	0
<b>Picture 2:</b> Boy is sitting down holding a soccer ball. Boy has blood on his knee and is frowning.	"The boy doesn't like when people trip him."	0.5	"I don't know"	0	0.5
<b>Picture 3:</b> Three basketball players wearing red jerseys; all are smiling and cheering. One player in white jersey who is frowning.	"They [red team] are winning."	1	"They worked hard as a team."	0.5	1.5
<b>TOTAL POINTS (out of 9)</b>					<b>2.0</b> <b>(22%)</b>

### Data Collected During Intervention

At three points during the implementation of the intervention, data were collected to show Claude's progress in making inferences. These sessions were audio recorded for the purposes of determining the percentage of opportunities in which the student inferred a missing

word in a cloze sentence, the percentage of instances in which the student inferred the meaning of an obscured sentence in a passage, and the percentage of correct responses to implicit questions.

As Graph 4.4 indicates, the first session data was collected in this manner was Session 3, 7/9/12. Claude had only participated in the intervention procedures one day prior to this session, due to pre-testing and an absence. Thus, this data provides a relative “baseline” for his inference-making abilities. As indicated, Claude correctly inferred a missing word in a cloze sentence in 33% of opportunities; similarly, he inferred a missing sentence in a passage 33% of the time. His number of correct answers to implicit questions – those requiring the reader to make an inference – was 20%, as he answered 1 out of 5 questions correctly.

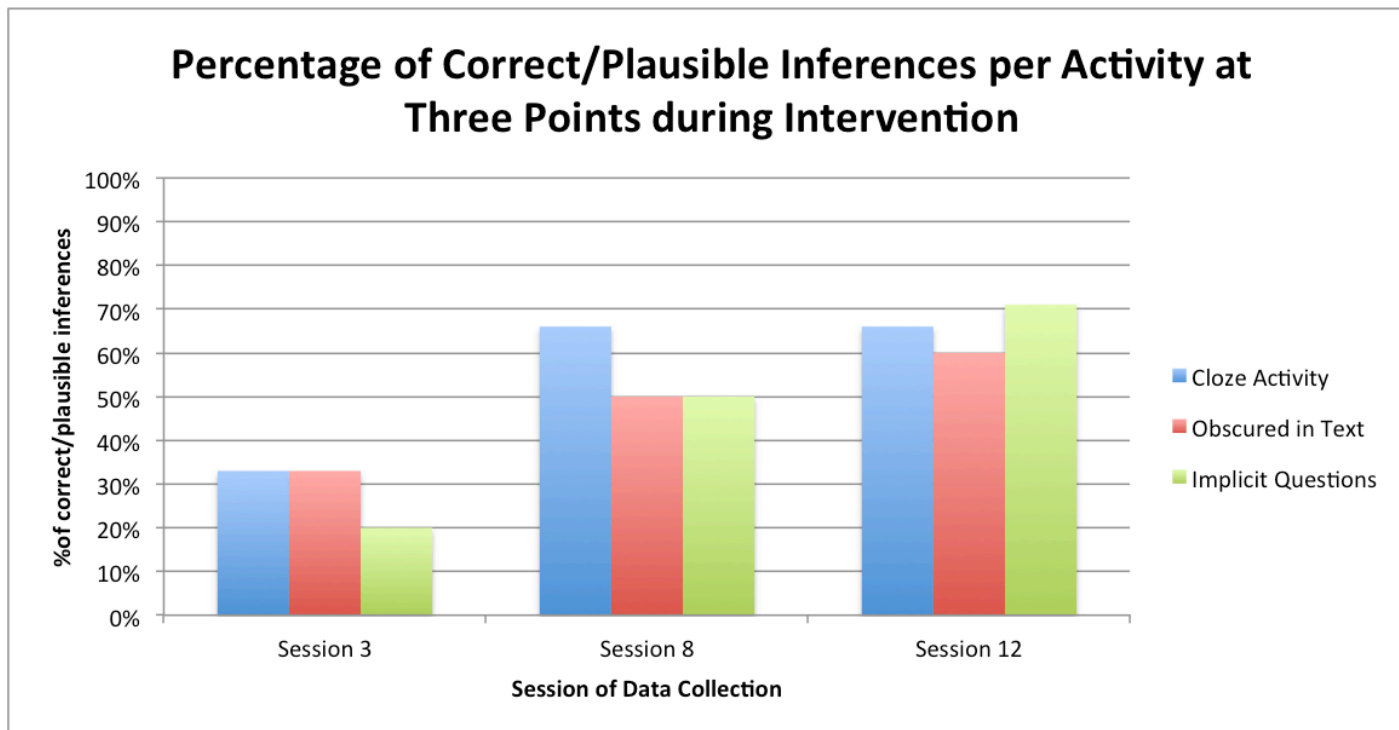
In the next session in which data were collected, Session 8 on 7/16/12, Claude had participated in 6 intervention sessions. At this point, Claude inferred missing words in cloze sentences in 66% of opportunities and obscured sentences in passages in 50% of opportunities. Claude’s answers to implicit comprehension questions also increased; he answered 3 out of 6 questions correctly (50%).

Finally, data was collected in Session 12, which took place on 7/23/12. At the time of this session, Claude had participated in 9 sessions with the intervention procedures. Claude provided a correct or plausible word or phrase in the cloze activity in 4 out of 6 opportunities (66%). Furthermore, he supplied a correct or plausible phrase or sentence obscured in the text in 3 out 5 opportunities (60%) and answered 5 out of 7 implicit questions correctly (71%).

As the bars on Graph 4.4 indicate, Claude’s percentage of correct or plausible responses in each of the three activities increased between Session 3, Session 8, and Session 12. It should be noted, however, that the texts used in each intervention session varied; for example, the book

in Session 3, *Nate the Great*, is a simple chapter book with some pictures; the book in Session 12, *Salt in His Shoes*, is a picture book but has more challenging vocabulary. Each book, however, was between a Level K and Level M according to Fountas and Pinnell (Fountas & Pinnell, 2007).

Graph 4.4: Percentage of Correct/Plausible Inferences per Activity during Intervention



### Post-Intervention Results of the QRI-5

To examine overall reading ability, accuracy, and comprehension subsequent to the intervention, the QRI-5 was administered during the last session. Claude began with the word identification lists. As Column 3 in Table 4.5 illustrates, Claude performed at the independent level on pre-primer, primer and first grade word identification lists. However, when presented



with the second grade word list, Claude performed at the instructional level, identifying 85% of words correctly overall. Although Claude identified slightly more words automatically post-intervention, his instructional level for word identification did not change from pre- to post-intervention.

Table 4.5: Results of QRI-5 Word Identification Pre-Intervention and Post-Intervention

Level	PRE-INTERVENTION			POST-INTERVENTION		
	Percent Total Correct Automatic	Total Correct Overall	Level	Percent Total Correct Automatic	Total Correct Overall	Level
Pre-Primer 1	100%	100%	Independent	100%	100%	Independent
Pre-Primer 2/3	90%	100%	Independent	95%	100%	Independent
Primer	95%	95%	Independent	100%	100%	Independent
First	90%	100%	Independent	95%	100%	Independent
Second	75%	85%	Instructional	85%	85%	Instructional

Following the word identification task, Claude was assessed with the Level One narrative “Mouse in a House.” As Table 4.6 indicates, Claude scored 33% on the prediction task, suggesting that he was unfamiliar with the topics, which included “how people feel about mice, an old house for sale, and a mouse inside a house” (Leslie & Caldwell, 2011, p. 185). Claude, reading approximately 61 words per minute, had 3 miscues, suggesting he is at the independent level in the area of accuracy. From pre-intervention to post-intervention, his accuracy and rate stayed relatively stable.

With regards to the comprehension portion of the QRI-5, the post-intervention results indicate that Claude retold 4 out of 44 possible events for the story. This narrative included 4 explicit and 2 implicit comprehension questions. Claude answered 3 of the 4 (75%) of the explicit questions correctly. He answered 1 out of 2 (50%) of the implicit questions correctly, putting him, overall, at the instructional level for Level 1. As Table 4.6 illustrates, Claude answered the same percentage of explicit and implicit comprehension questions pre- and post-intervention.

Table 4.6: Results of QRI-5, Pre-Intervention vs. Post-Intervention

<b>QRI-5 Measure</b>	<b>Claude's Results Pre-Intervention</b>	<b>Claude's Results Post-Intervention</b>
<b>Level / Title</b>	Level One "The Surprise" (narrative)	Level One "Mouse in a House" (narrative)
<b>Prediction Task</b>	55% <i>unfamiliar</i>	33% <i>unfamiliar</i>
<b>Accuracy</b>	99% <i>independent</i>	98.8% <i>independent</i>
<b>Rate</b>	57 wpm	61 wpm
<b>Retelling Task</b>	17 events recalled (38%)	4 events recalled (9%)
<b>Comprehension</b>		
<b>Explicit</b>	75%	75%
<b>Implicit</b>	50%	50%
<b>Overall</b>	66% <i>instructional</i>	66% <i>instructional</i>

**Post-Intervention Results of Informal Inference Assessment**

The Informal Inference Assessment was administered during the last session to establish post-intervention inference ability. The same three pictures were presented. As table 4.7 indicates, Claude made a plausible inference in three out of three opportunities (100%). Furthermore, as the table indicates, Claude provided partial justification for two of his inferences, citing a clue in the second picture and evidencing background knowledge in the third. Overall, Claude scored 50% on this informal assessment; this is more than double his percentage of the pre-assessment, on which he scored 22%.

Table 4.7: Results of Informal Inference Assessment, Post-Intervention

<b>Description of Picture</b>	<b>Claude's inference</b> (What is happening in this picture?)	<b>Plausible inference</b>  <b>1 POINT</b>	<b>Claude's justification</b> (How do you know that? What makes you think that?)	<b>Plausible explanation</b> Background Knowledge and Clues  <b>2 POINTS</b>	<b>TOTAL POINTS</b>  <b>OUT OF 3 POINTS</b>
<b>Picture 1:</b> Baby being fed green baby food. Baby is spitting out the food.	"The baby is sad about his food."	1	"The baby is hungry."	0	1
<b>Picture 2:</b> Boy is sitting down holding a soccer ball. Boy has blood on his knee and is frowning.	"The boy is mad because the ball hit him in the knee."	1	"He's crying."	1 (does not reference blood/knee)	2
<b>Picture 3:</b> Three basketball players wearing red jerseys; all are smiling and cheering. One player in white jersey who is frowning.	"That team is happy because they won the game."	1	"They practiced at school."	0.5 (background knowledge)	1.5
<b>TOTAL POINTS (out of 9)</b>					<b>4.5</b> <b>(50%)</b>

## Conclusion

The focus of this intervention was to improve Claude's ability to make inferences to improve reading comprehension. As the results indicate, Claude showed an increase in the inference activities that were included in the daily procedures, which included making inferences

using cloze sentences, obscured sentences, and answering implicit questions. However, Claude's scores on the QRI-5, particularly in the area of implicit comprehension questions, did not change from pre- to post-intervention. The next chapter provides an explanation and further recommendations relevant to the results.

## CHAPTER 5

### Discussion

An intervention targeting the generation of inferences was designed and implemented based on the needs and IEP specifications of Claude, a third-grade boy. Claude qualified for special education services in the area of Specific Learning Disability, although he also has a medical diagnosis of ADHD. In this chapter, the results of the intervention are analyzed and connected to the existing research in this area, including studies that have been performed on larger populations of students. Additionally, the intervention's relevancy to the Common Core Standards are discussed, as all as the strengths and limitations of this study. Finally, instructional recommendations for Claude's future success – particularly in the area of reading comprehension – are discussed.

#### **Connections to existing research**

To be a successful reader in the long term, research indicates that a child must acquire foundational skills in each of the main components of literacy, including phonemic awareness, phonics, fluency, vocabulary, and comprehension. Students who are at-risk for reading and students with disabilities often struggle with one or more of these components, which effects reading ability in the long term. The participant in this study, Claude, fits this profile in that he appears to be proficient in phonemic awareness, phonics, and fluency, yet struggles particularly with reading comprehension.

The results of the QRI-5 indicate that Claude has the necessary foundational skills in the areas of phonemic awareness, phonics, and fluency. Claude read accurately, performing

independently on the word identification list at the second level and reading narratives with 98% to 99% accuracy. Furthermore, his rate of 58 to 61 words per minute is appropriate for his grade level (Leslie & Caldwell, 2011, p. 70). While vocabulary is not measured on the QRI-5, Claude's scores in the areas of word identification, accuracy, rate, and comprehension indicate that his relative weakness was reading comprehension. As the study by Applegate, Applegate and Modla (2009) found, even a reader who appears to be successful because he or she reads accurately and fluently may struggle to derive meaning from the text. Claude fits into this category, which puts him at risk for long-term reading failure.

Furthermore, reading comprehension – particularly inferential thinking - may be particularly challenging for boys with ADHD (Berthiaume, Lorch, & Milich, 2010). Claude has a diagnosis of ADHD by a medical professional. While a review of historical data suggest that Claude was taking medication to address symptoms during the school year, per his mother, Claude was not taking his medication during the implementation of the intervention. This was apparent during the intervention sessions, as Claude exhibited inattentive behavior, including wandering eyes, getting up from the table, flipping through the book while reading, and off-topic conversation.

In the Berthiaume et.al. (2010) study, the boys with ADHD (who were not medicated, similar to Claude) performed more poorly overall than their comparison peers without ADHD. More specifically, the boys with ADHD struggled more in identifying inconsistent information in a story; additionally, while the boys with ADHD made the same number of statements when describing their inferential thinking, they also made more incorrect or implausible inferences (Berthiaume, Lorch, & Milich, 2010). Claude also made many implausible inferences, which

was evident in the results of the QRI-5 and informal inference assessment, as well as in the data collected throughout the daily intervention procedures (see Chapter 4).

The intervention procedures were designed based on research regarding students of a similar age with similar reading difficulties. Collectively, research shows that it is important to explicitly teach the skill of making an inference. Many studies employed steps similar to those incorporated into the intervention used in this study. These included activating background knowledge, looking for textual clues, and encouraging students' to use metacognitive strategies such as explaining their thinking (McGee & Johnson, 2003; Dewitz, Carr, & Patberg, 1987; Fritschmann, Deshler, & Schumaker, 2007). The intervention implemented with Claude used similar methods to introduce the skill. The strategy "background knowledge + clues in the text = inference" was taught using a graphic organizer as a "cueing system," multiple "think-alouds," and gradual release of responsibility.

The intervention also included strategies to scaffold the skills by making inferences on several levels. Two similar studies – one by McGee and Johnson (2003) and the other by Dewitz, Carr, and Patberg (1987) - found that making inferences at the sentence level, such as inferring missing words in cloze sentence or a missing sentence in a short passage, may be particularly effective for elementary students. Claude completed these tasks daily; the results indicate that Claude did progress from the beginning to the end of the intervention with these two activities. Both activities provided a foundation for using the inference strategy when reading longer texts and answering comprehension questions, which was the third and largest component of the everyday intervention procedure.



### **Connections to Common Core Standards**

Throughout the intervention, several elements of the Common Core Standards were addressed. Although Claude's accuracy and fluency were appropriate for his grade level, it is evident that his comprehension skills were below grade level. Thus, this intervention addressed elements of both 2<sup>nd</sup> grade standards as remediation and elements of 3<sup>rd</sup> grade standards as pre-teaching.

One of the 2<sup>nd</sup> grade literature standard states, "By the end of the year, read and comprehend literature, including stories and poetry, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range" (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p. 11). Similarly, one of the 3<sup>rd</sup> grade literature standards states, "By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 2–3 text complexity band independently and proficiently" (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, p. 12). While neither standard directly references making inferences in reading, it is essential to fully comprehend literature. As research indicates, proficient readers form and modify inferences continually while reading based on the reader's background knowledge and clues in the text. Without the ability to make inferences, comprehension is compromised (McGee & Johnson, 2003).

### **Explanation of Results**

Claude was assessed at pre- and post-intervention using the QRI-5 and an informal inference assessment. The QRI-5 assesses word identification, accuracy, rate, and comprehension. The informal inference assessment was designed to assess the generation and

explanation of an inference based on a picture. Additionally, data was collected regarding Claude's progress with the intervention procedures.

The results of the QRI-5 indicate that Claude did not progress in the areas of word identification, accuracy, and rate. However, this was expected, as the intervention was focused on comprehension. The text was sectioned so that Claude read the text orally for approximately 10 minutes per day; prompts and cues were provided for words with which he struggled. The remaining portion of the text was read using partner reading. However, time was not spent focusing on self-correcting, improving speed, or managing miscues; thus, an improvement in those areas was not anticipated.

While the intervention focused on reading comprehension, Claude's scores on the comprehension portion of the QRI-5 were the same from pre- to post-intervention. In both instances, for the same level narrative, he answered 75% of explicit questions and 50% of implicit questions correctly, which suggests that Claude's overall reading comprehension did not improve. However, his scores on the informal inference assessment did improve (from 22% to 50%), which might suggest his inferential thinking did, in fact, progress. The difference in results may reflect the type of assessment. As studies suggest, children with diagnoses of ADHD may struggle to monitor their understanding while reading. During the QRI-5, Claude often seemed so focused on accuracy and rate that he may not have been able to attend to his comprehension of the text. However, the informal inference assessment used pictures to assess inference generation. Without text, Claude may have been able to better focus on employing and applying the inference strategy.

Similarly, the data collected during the intervention suggest that Claude improved in his ability to make inferences within the intervention procedures, including inferring a missing word

in a cloze sentence (33% in Session 3 to 66% in Session 12), inferring an obscured sentence in a passage (33% in Session 3 to 61% in Session 12), and answering implicit comprehension questions (20% in Session 3 to 71% in Session 12). As the intervention procedures were repeated daily, Claude might have been afforded an opportunity to become accustomed to the procedures rather than truly learn the strategy. According to the anecdotal notes, Claude's explicit use of the strategy, i.e. pointing to the coordinating boxes on the graphic organizer and/or explaining his thinking, was not observed. While the researcher attempted to have Claude justify his answer such as asking, "How do you know that?," he did not respond or said, "I don't know," even with prompting. It was necessary to prompt Claude several times to listen to and answer a question, much less justify his answer.

Certainly, Claude did improve in his ability to make inferences in the general sense, based on his improved scores on the informal inference assessment and the intervention procedures. However, there is not evidence to show that Claude's improvement is a direct result of the strategy targeted in this intervention. Claude's progression in his ability to make inferences for pictures, as well as make inferences at the sentence, paragraph, and short passage level, suggest that Claude gained some of the foundational skills necessary for this skill. As he matures and his literacy skills develop, his generation and justification of inferences based on more challenging passages, such as those included in the QRI-5 assessments, may improve.

Finally, it is important to note that the intervention was affected by Claude's inattentiveness. Prior to the intervention, teacher and parent interviews indicated that Claude was taking medication for symptoms of ADHD and that it was well managed during the school year. However, Claude's mother stated that Claude did not take the medication during the

course of the intervention. Due to the severity and frequency of his inattentive behaviors, this may have been a significant factor that hindered his progress in this intervention.

### **Strengths and Limitations**

This study has several strengths and limitations. On a daily basis, the intervention procedures were consistent and repeated. Claude's level inattentiveness and distractibility necessitated a routine. Any new activities or setting changes (e.g., change in tutoring location; completing the cloze activity first) appeared to exacerbate his inattentiveness. Thus, keeping the sequence, schedule, and expectations consistent aided in Claude's success, as demonstrated by his improved scores in the three intervention activities.

Furthermore, it is highly beneficial for the intervention to have been completed in a one-on-one manner. Claude would have struggled even more to attend to academic tasks if peers were present. Similarly, working one-on-one allowed for the intervention to be tailored to his unique needs and allowed for materials of high-interest to Claude to be used for engagement (e.g., books about basketball).

While working one-on-one in an individually tailored, repeated intervention was beneficial, several limitations to this study also exist. As this is a case study and the intervention was implemented with only one student, it cannot be generalized to a larger population. Perhaps more significantly, however, the intervention was implemented for only 11 sessions. Making inferences is a challenging task even for older students; a younger student, such as Claude, may need a significant amount of time and more trials for this skill to be solidified.

The most substantial limitation, however, regards Claude's tendency to be inattentive and distracted during throughout the intervention. While historical records indicate that Claude was

taking medication to address his symptoms of ADHD, Claude's mother reported that Claude was not taking medication during the course of the intervention. Claude's behavior manifested during the intervention as fidgeting, getting up from the table, wandering around the room, answering questions and making comments at inappropriate times, looking around the room, and flipping through the book in the midst of reading. It was often necessary to use several prompts for Claude to complete even simple tasks during the intervention, such as listening to and responding to questions. The use of the current intervention with the addition of procedures to sustain attention should be used with students with similar ADHD characteristics.

### **Recommendations for student**

Currently, Claude's skills in the area of phonemic awareness, phonics, and fluency are appropriate for his age and grade level. However, the results of the intervention reveal some areas in which Claude would benefit from further instruction.

As evidenced in Chapter 4, the results indicate that Claude improved in the three main activities included in the intervention (cloze sentences, obscured sentences in paragraphs, and implicit questions). However, Claude scores did not increase in the percentage of implicit questions on the QRI-5 from pre-test to post-test. While the series of activities afforded the opportunity for inferencing to be scaffolded throughout the intervention, Claude may need additional time to become proficient with the skill. If Claude continues to practice making inferences at the word and sentence level, he will experience success, which is important for his motivation. At the same time, gradually increasing the frequency of answering implicit questions at the end of longer passages will allow him to improve in answering inferential questions presented in assessment formats, such as the QRI-5. As Claude's skills in

mathematics progress, it will also be important to apply the strategies introduced in this intervention to ensure proficient comprehension of story problems.

Furthermore, it is recommended that future instructors address Claude's needs in the area of attention and distractibility. Claude's progress in this intervention was affected by his ability to complete even simple tasks, such as attending long enough to listen to and respond to a question. While Claude responded well to incentives and preferred activity time, he often became so focused on earning this opportunity that he could not focus on the academic task. Similarly, in future instruction, Claude will benefit from working in a small, quiet environment to limit distractions. While a longer span of attention is important to completing tasks, it may also aid in Claude's ability to monitor his understanding while reading.

## **Conclusion**

Claude participated in an intervention which aimed to increase his ability to make inferences using the strategy "background knowledge + clues in the text = inference." The results indicate that Claude improved in the "foundational" areas of making inferences, such as generating inferences for pictures and short, simple texts (sentence or short passage) but these skills have not yet transferred to longer, more challenging texts, such as the texts used in the QRI-5. While the intervention procedures were repeated and consistent, the results of this study were affected by the limited time for intervention, the difficulty of the skill, and Claude's struggle to attend to tasks. Claude would benefit from further instruction and scaffolding with gradually longer, more challenging texts to continue to improve his ability to generate and justify inferences.

### References

- American Psychiatric Association. 2012. Attention deficit/hyperactivity disorder. *DSM-5 Development*. Retrieved from <http://www.dsm5.org/ProposedRevisions/Pages/proposedrevision.aspx?rid=383#>.
- Applegate, M., Applegate, A., & Modla, V. (2009). "She's my best reader; she just can't comprehend": Studying the relationship between fluency and comprehension. *The Reading Teacher*, 62(6), 512-521.
- Applegate, M., Quinn, K. & Applegate, A. (2008). *The critical reading inventory: Assessing students' reading and thinking* (2<sup>nd</sup> ed). Upper Saddle River, NJ: Pearson.
- Banks, K. (1999) *Howie Boyles, secret agent*. New York: Frances Foster Books.
- Berthiaume, K.S., Lorch, E.P., & Milich, R. (2010). Inferential processing and comprehension monitoring in boys with ADHD. *Journal of Attention Disorders* 14(1), 31-41.
- Bilsky, L.H., Blachman, S., Chi, C., Mui, A.C., & Winter, P. (1986). Comprehension strategies in math problem and story contexts. *Cognition and Instruction* 3(2), 109-126.
- Dewitz, P., Carr, E., & Patberg, J. (1987). Effects of inference training on comprehension and comprehension monitoring. *Reading Research Quarterly*. 22, 99-121.

- Dunn, L. (1965). *Peabody Picture Vocabulary Test*. Circle Pines, Minnesota: American Guidance Service.
- Dunn, L.M. and Dunn, L.M. (1981). *Peabody Picture Vocabulary Test—Revised*. Circle Pines, MN: American Guidance Service.
- Dunn, L. & Dunn, L. (1997). *Peabody Picture Vocabulary Test (3<sup>rd</sup> Ed.)*. Circle Pines, MN: American Guidance Services.
- Fountas, I.C. & Pinnell, G.S. (2007). *Fountas and Pinnell benchmark assessment system*. Portsmouth, NH: Heinemann.
- Fritschmann, N.S., Deshler, D.D., & Schumaker, J.B. (2007). The effects of instruction in an inference strategy on the reading comprehension skills of adolescents with disabilities. *Learning Disability Quarterly (30)4*, 245-262.
- Gates, A. & MacGinitie, W. (1978) *Gates–MacGinitie Reading Tests*. New York: Teachers College Press.
- Gray, W. (1967) *Gray Oral Reading Test*. New York: Bobbs-Merrill.
- Hemphill, L. & Tivnan, T. (2008). The importance of early vocabulary for literacy achievement in high-poverty schools. *Journal of Education for Students Placed at Risk, 13*, 426-451.



Hieronymus, A. N., Hoover, H. D., & Lindquist, E. R. (1986). *Iowa Tests of Basic Skills*.

Chicago: Riverside.

Johnson, H. & A. Mcgee (2003). The effect of inference training on skilled and less skilled comprehenders. *Educational Psychology* 23(1), 49-59.

Kaplan, E., Goodglass, H. and Weintraub, S. (1983). *The Boston Naming Test*. Philadelphia: Lea and Febiger.

Kochnower, J., Richardson, E., & DiBenedetto, B. (2001). A comparison of the phonic decoding ability of normal and learning disabled children. *Journal of Learning Disabilities* 16(6), 348-351.

Leslie, L., & Caldwell, J. (2011). *Qualitative reading inventory* (5<sup>th</sup> ed.). Boston, MA: Pearson/Allyn & Bacon.

MacGinitie, W., MacGinitie, R., Maria, K. & Dreyer, L. (2000). *The Gates-MacGinitie Reading Tests* (4<sup>th</sup> Ed.). Itasca, IL: Riverside.

Mcgee, A. & Johnson, H. (2003). The effect of inference training on skilled and less skilled comprehenders. *Educational Psychology* 23(1), 49-59.

National Governors Association Center for Best Practices & Council of Chief State School

Officers (2012). Common core state standards initiative. Retrieved from

<http://www.corestandards.org/>

National Governors Association Center for Best Practices & Council of Chief State School

Officers (2010). *Common core state standards (English-language arts)*. Washington,

D.C.: National Governors Association Center for Best Practice & Council of Chief State

School Officers.

National Governors Association Center for Best Practices & Council of Chief State School

Officers (2010). *Common core state standards (Math)*. Washington, D.C.: National

Governors Association Center for Best Practice & Council of Chief State School

Officers.

Neale, M.D. (1989). *The Neale Analysis of Reading Ability* (British Ed.). Oxford: NFER-

Nelson.

Richardson, E., DiBenedetto, B., & Adler, A. (1979b). *Interim manual for the DST: Decoding*

*skills test*. Stony Brook, NY: Long Island Research Institute.

Sharmart, M.W. (1972). *Nate the great*. New York: Random House.

- Snider, V. (1997). The relationship between phonemic awareness and later reading achievement. *The Journal of Educational Research* 40(4), 203-211.
- Snow, C., Tabors, P., Nicholson, P. & Kurland, B.F. (1995). SHELL: Oral language and early literacy skills in kindergarten and first-grade children. *Journal of Research in Childhood Education*, 10, 37-48.
- Sovik, N., Frostrad, P., & Heggeberget, M. (1999). The relation between reading comprehension and task-specific strategies used in arithmetical word problems. *Scandinavian Journal of Education Research* 43(4), 371-398).
- Speece, D. & Case, L. (2001). Classification in context: An alternative approach to identifying early reading disability. *Journal of Educational Psychology*, 93, 735-749.
- Speece, D. & Ritchey, K. (2005). A longitudinal study of the development of oral reading fluency in young children at risk for reading failure. *Journal of Learning Disabilities* 38(5), 387-399.
- Tiegs, E.W & Clark, W.W. (1977). *California achievement test*. Monterey, CA: McGraw Hill.
- Torgesen, J., Wagner, R. & Rashotte, C. (1999). *TOWRE: Test of word reading efficiency*. Austin, TX: PRO-ED.

U.S. Department of Education. Building the legacy: IDEA 2004. *ED.gov*. Retrieved from <http://idea.ed.gov/explore/view/p/%2Croot%2Cdynamic%2CTopicalArea%2C3%2C>

Wagner, R., Torgesen, J. & Rashotte, C. (1999). *Comprehensive test of phonological processing*. Austin, TX: PRO-ED.

Wechsler, D. (1974). *Wechsler intelligence scale for children – revised*. New York, NY: Psychological Corp.

Wechsler, D. (1989). *Wechsler preschool and primary scale of intelligence – revised*. San Antonio, TX: The Psychological Corporation.

Wechsler, D. (1991). *Wechsler intelligence scale for children—third edition*. San Antonio, TX: The Psychological Corporation.

Williams, K.T. (2001). *GRADE: Group Reading Assessment and Diagnostic Evaluation*. Shoreview, MN: Pearson AGS Globe.

Wolf, M. (1986) Rapid alternating stimulus naming in developmental dyslexia. *Brain and Language*, 27, 360–379.

Wolf, M. & Segal, D. (1999). Retrieval rate, accuracy, and vocabulary elaboration (RAVE) in reading-impaired children: A pilot intervention programme. *Dyslexia* 5, 1-27.

Woodcock, R. (1997). *Woodcock Diagnostic Reading Battery*. Itasca, IL: Riverside.

Woodcock, R.R., McGrew, K.S., & Mather, N. (2001). *Woodcock-Johnson III tests of cognitive abilities*. Itasca, NY: [Riverside](#).

Yopp, H. (1995). Yopp-Singer Test of Phoneme Segmentation. *Reading Teacher, 49*, 20-29.

**APPENDIX A**

***The following is a reference list of books used during intervention:***

Banks, K. (1999) *Howie Boyles, secret agent*. New York: Frances Foster Books.

Barrett, J. (1970). *Animals should definitely not wear clothing*. New York, NY: Aladdin Paperbacks.

Calhoun, M. (1981). *Hot air Henry*. New York: Morrow Junior Books.

Coy, J. (1999). *Strong to the hoop*. New York: Lee & Low Books, Inc.

Jordan, D & Jordan, R. M. (2000). *Salt in his shoes: Michael Jordan, in pursuit of a dream*. New York: Simon & Schuster,

Kasza, K. (2003). *My lucky day*. New York: G.P. Putnam's Sons.

Simont, M. (2001). *The stray dog*. Harper Collins Publishers.

Sharmart, M.W. (1972). *Nate the great*. New York: Random House.

APPENDIX B

**Making Inferences:**  
Reading Between the Lines

**Question:** (from the book, our group, or my teacher)

-----  
-----  
-----

What I know from the *book*:

-----  
-----  
-----  
-----  
-----

What I know from my *brain*:

-----  
-----  
-----  
-----  
-----

-----  
-----  
-----  
-----  
-----  
-----  
-----

**My Inference**

(be sure to use at least one "because")

## APPENDIX C

## Session-by-Session Anecdotal Notes and Planning Chart

SESSION	INSTRUCTIONAL PLAN	SPECIFIC OBSERVATIONS FROM LESSON	CONCERNS/CHANGES WARRANTED
Session 1: 7/2/12	Administer QRI-5 and informal inference assessment (using 3 pictures) to establish present reading level and inference ability.	<p>Claude came willingly to our tutoring room. He was talkative and engaged in conversation regarding his school and family during a get-to-know-you activity.</p> <p>Administered Primer level of QRI-5; student tested at the independent level.</p> <p>Administered Level 1; student tested at the instructional level. Scores of comprehension were well below accuracy scores, as expected based on student profile.</p> <p>Administered informal inference assessment, in which I showed 3 pictures and asked him to tell what he thought was happening. He provided a response for each picture; however, he needed more questions/prompts than I expected to explain his thinking. I had not considered how additional questions/prompts would be taken into account.</p>	Revise informal inference assessment so that additional questioning/prompts is accounted for. Select 3 new pictures and re-administer during Session 2.
Session 2: 7/3/12	<p>Re-administer revised informal inference assessment.</p> <p>Introduce inference strategy using picture cues: "background knowledge (brain) + clues in the text (magnifying glass) = inference."</p> <p>Use think-alouds to introduce inferring words in 3 cloze sentences and the text <i>Why Animals Should Definitely</i></p>	Student Absent	Instructional plan for Session 2 will be completed at the next session attended by the student.



	<i>Not Wear Clothing.</i>		
Session 3: 7/5/12	See Session 2 Plan	<p>Claude came willingly to the tutoring room and began the session attentively and eagerly. He completed the revised informal inference assessment; he attempted explained his answers using previously established questions/prompts that I provided. I presented the picture cues and taped them on the board, demonstrating how we would use this with a picture of a basketball player.</p> <p>I started to read <i>Why Animals Should Definitely Not Wear Clothing</i> aloud (so that Claude could focus on the think-alouds) and stopping at pre-determined points to demonstrate making an inference. As the story went along, I engaged Claude in providing some of the background knowledge (e.g., giraffes have long necks) and clues in the text/pictures (e.g., the porcupine's quills look sharp). While Claude did provide some answers, it should be noted that Claude did not seem to be fully attending to the task; his eyes were wandering and I often needed to repeat or rephrase the questions several times before Claude provided an answer.</p>	Create and implement an incentive system for Claude.
Session 4: 7/9/12	<p>Introduce incentive chart and begin the following routine (using mostly think-alouds, as the strategy was introduced 3 days ago):</p> <ol style="list-style-type: none"> <li>1) Warm-up: finish get-to-know-you activity poster</li> <li>2) Infer missing words in 3 cloze sentences</li> </ol>	<p>Claude came willingly to the room and completed the warm-up activity. He seemed eager to earn points for the incentive.</p> <p>We went through 3 cloze sentences; he asked to complete the first one independently and did so successfully. I thought he might be capable of completing the other sentences; however, he needed strategic questioning to complete them, demonstrating that this is a skill we should continue to work on.</p> <p>We began reading <i>Nate the Great</i>; however, Claude demonstrated</p>	Claude's ability to attend to tasks may be below what I originally thought. Monitor in next session to see if changes need to be made.

	<p>3) Preview new vocabulary words from today's text</p> <p>4) Read aloud <i>Nate the Great</i>, p. 1-17 stopping at pre-determined points to infer obscured word or sentence</p> <p>5) Answer comprehension questions – oral and/or written</p>	<p>significant difficulty attending to the task. Although his body was still and he appeared to be paying attention (even reading out loud), he frequently asked off-topic questions, such as “Can I play a game?” or “What time is it?” Despite seeming distracted, Claude did attempt to answer the inference-based comprehension questions. For two out of the five oral questions, Claude provided a logical answer but could not explain why (background knowledge/text clues). For these questions, then, I prompted him by pointing out words or pictures that supported his answer. For the remaining questions, I did think-alouds. For the final question, I asked Claude to provide a written response to the question, “How old do you think Nate is? How do you know?” Claude responded with 7 years old. When asked, “Why do you think he’s 7?,” Claude responded with an unrelated answer - “His birthday is coming up.” We worked together to answer the question, “Why?” by looking at Nate’s picture.</p>	
<p>Session 5: 7/10/12</p>	<p>Follow routine, this time using <i>Nate the Great</i> p. 18-31; gradual release of responsibility</p> <p>Present 3 dog pictures (2 small dogs; 1 big dog) – “Which one might be Fang? Why?”</p>	<p>Claude was presented with the 3 cloze sentences and provided logical words for all. However, when I asked Claude why he thought that word made sense, he either could not provide the answer. I prompted him to by using the picture cues (background knowledge/text clues) on the board.</p> <p>Today, when we stopped at pre-determined points to make inferences, Claude often seemed like he didn’t hear my question. I had to repeat it several times and redirect his attention before receiving an answer. His attention to the task was again limited – often asking tangential questions and/or making off-topic statements. He much for fidgety as well, repeatedly getting</p>	<p>Create visual schedule/checklist to help Claude attend to tasks.</p> <p>Consider creating/finding a “graphic organizer” or something to put on the</p>

		<p>up to the table to look at things around the room.</p> <p>At the end, I presented Claude with 3 pictures of dogs and asked which one could be Fang. Fang is described in the text as a, “big, big dog with big, big teeth.” Claude chose the picture of the smallest dog. I re-read the sentences describing the dog and asked if he still thought it was the smallest dog. He then picked the picture of the big dog, but he explained his answer by stating it was that one because the dog is yellow.</p> <p>It is evident that Claude is able to making simple inferences but struggles to explain his thinking and why it makes sense.</p>	<p>table in front of Claude which will provide cue for explaining his inference.</p>
<p>Session 6: 7/11/12</p>	<p>Follow routine using <i>Nate the Great</i>, p. 32-46.</p>	<p>Before beginning our work today, I showed Claude a checklist of items we needed to finish. It clearly showed where break time, incentive time, and lunchtime occurred within the hour. While I thought the schedule might help Claude in maintaining his attention, it seems to have done the opposite, as he repeatedly referred to the schedule and asking how much longer for each task, even in the middle of a conversation about something else. Claude again provided plausible inferences in 7 out of 8 opportunities; however, he could only justify his answer in 1 of those opportunities. It is unclear whether this is due to not being able to verbalize his thinking or if it is because he cannot attend to the question.</p>	<p>I am concerned that Claude’s inattention to tasks may be negatively hindering his progress with the intervention. Perhaps “changing things up” and making the activities more engaging would help him sustain attention.</p>
<p>Session 7: 7/12/12</p>	<p>Follow routine using <i>Nate the Great</i>, p. 46-end. Complete cloze sentences on the iPad to increase</p>	<p>Claude asked if we had to read <i>Nate the Great</i> again. He explained that he thought the book was boring. I asked him what kind of book he’d like to read next time. Claude completed the cloze sentences</p>	<p>Find a book that fits Claude’s interest (basketball) for after <i>Nate the Great</i></p>

	<p>engagement; present magnifying glass to “find clues”</p> <p>Introduce and model using graphic organizer to both provide oral response and written response</p>	<p>on the iPad but became really frustrated/distracted by typing the words into the blanks. Answers such as <i>waterpark</i> for the cloze sentence, “He wanted to go to the _____ so he could swing,” indicate that Claude might not be reading the clues AFTER the blank, which might be important to forming an inference. Once I asked him to read the rest of the sentence, he immediately said <i>park</i>. When I asked why, he said, “because he wanted to swing.”</p> <p>I modeled using the graphic organizer for both an oral and a written inference answer before asking Claude to attempt using it. So that Claude wouldn’t be overwhelmed, I first asked him to just point to the boxes on the graphic organizer and answer the question, “How old do you think Harry is?” Claude answered “I think Harry is 9.” He needed prompting to know where to put “Harry’s drawing is sloppy.” He did not demonstrate the use of background knowledge, even when I asked what he knows about kids and drawing.</p>	<p>Ensure Claude is reading the entire sentence/passage to find all of the clues</p>
<p>Session 8: 7/16/12</p>	<p>Follow routine but use new book (picture book) - <i>Strong to the Hoop</i></p>	<p>Today, I found Claude in the hallway outside of his classroom crying. I asked him what was wrong and he stated that he received a “2” on the school’s behavior rating system the previous hour and he thought he should have gotten a “3”. We had a conversation about changing his day around and I gave him a 3 minute break.</p> <p>Claude finally walked to the room after approximately 10 minutes, but continued to cry, lay on the floor, and refuse to do work for another 15 minutes. His behavior changed when the director the school happened to walk into the room and threaten to call</p>	<p>Email or contact parent to make aware of the situation.</p>

		<p>his mom.</p> <p>We did complete the cloze activity, read <i>Strong to the Hoop</i>, and answer the questions, however, we did not spend as much time discussing why his answers made sense, simply due to a lack of time.</p>	
<p>Session 9: 7/17/12</p>	<p>Continue routine, using book <i>Hot Air Henry</i>, p. 1-18.</p> <p>For cloze activity, use a missing sentence from a short passage.</p>	<p>Today, Claude came willingly and eagerly to the tutoring room. He seemed to be in a happy mood and stated that he had a good morning, although he had lost his glasses. Claude asked to complete the cloze activity (this time a short passage with a missing sentence) on the iPad. He stated that it was too hard to find a whole sentence; however, when I re-read the passage out loud and emphasized the clues (“It has pictures of <b>cows</b> and <b>pigs</b>. It has pictures of <b>zebras</b> and <b>giraffes</b>. _____ . It has pictures of <b>birds</b> and <b>squirrels</b>.”) he was able to say it’s about animals. I prompted him to think of two animals but he said he couldn’t; however, it was apparent that his lack of response was due to a lack of effort and/or distraction rather than not knowing.</p> <p>For the implicit questions related to the passage, Claude provided a logical inference in 4 out of 5 opportunities. The also provided logical explanations, demonstrated use of text clues, in 2 of the instances, which is an improvement!</p> <p>Although Claude was amicable and completed his work, he was very distracted by the loss of his glasses throughout the session. He got up from the table 3 times to look in desk drawers and asked several times if we could go find them.</p>	
<p>Session 10: 7/18/12</p>	<p>Follow routine, with text <i>Hot Air Henry</i>, p. 18-end.</p>	<p>Claude was crying at his desk when I arrived at his general education classroom; he stated he did not do</p>	

	Use short passage for cloze activities, filling in one missing sentence and one missing word.	<p>anything bad during the morning but had received a “2” on the behavior scale instead of a “3.” He did come willingly to the tutoring room, however. He refused to start the warm-up activity for approximately 7 minutes, until I showed him a comic book that we could read at the end. Claude completed the cloze activity with ease today. The passage was about going to the beach and he justified his sentence (I brought my sunscreen) by saying that it would be hot.</p> <p>When reading <i>Hot Air Henry</i>, Claude again seemed distracted, often stopping in the middle of a sentence and flipping through the pages to see how many were left. We responded orally to the implicit questions and pointed to the correlating boxes on the graphic organizer to justify the answer.</p>	
Session 11: 7/19/12	<p><i>Salt in His Shoes</i></p> <p>Written response using graphic organizer</p>	Student Absent	
Session 12: 7/23/12	See Session 11 Plan	<p>Claude came willingly to the tutoring room; he indicated that he had a great morning.</p> <p>Claude completed the cloze activities; he inferred the missing words in 2 out of 3 opportunities. However, he was not able to justify which clues he used. For example, in the sentence, “I was so excited to go to the _____ to swim!” Claude supplied two possibilities: YMCA and waterpark. When I asked him which word clue in the sentence he used, he needed 4 prompts to identify <i>swim</i>.</p> <p>Finally, Claude read the book <i>Salt in His Shoes</i>, a story about Michael Jordan as a child. Claude answered</p>	

		71% (5 out of 7) inferential comprehension questions correctly. Of the 5 questions, he provided a plausible justification, (i.e., I know that because...) in 3 out of 5 opportunities.	
Session 13: 7/24/12	Follow routine, using <i>My Lucky Day</i>  Cloze sentences on whiteboards (engagement)	Claude struggled to attend to any task today and repeatedly stated that he did not feel like working, even when presented with an opportunity to earn an incentive (one that he requested yesterday), Claude committed to finishing the work if he could play a game at the end; however, he still needed a significant amount of redirection and prompting. Claude completed the cloze activities on the whiteboard, however, he needed an average of 3 cues to complete each sentence. Claude then read <i>My Lucky Day</i> ; while he seemed interested in the book (relative to other days); I noted that he was asking several questions and looking at the pictures). This was a more challenging inference task for him because clues had to be collected along the way to infer the piglet's actions at the end of the story. We needed to go back and review the major points in the story in order for Claude to make the major inference at the end.	
Session 14: 7/25/12	<i>The Stray Dog</i>  Respond in writing on graphic organizer to implicit comprehension question	Today, the room that we usually work in was being painted and it was necessary to work in the cafeteria. Although there was no one in the cafeteria other than a cook, Claude seemed distracted by the new environment. He made off-topic comments/statements related to the room and his eyes appeared to be wandering around the room throughout our session. We did read <i>The Stray Dog</i> and responded to the obscured words/sentences, although I needed to give several prompts. However, when presented with the graphic organizer	Find a suitable location to work tomorrow that might be smaller/less distracting.

		and given the expectation that he would have to provide a written answer, he refused. At this point, a class came into the cafeteria and once we moved, time was up.	
Session 15: 7/26/12	Post-assessment data: administer QRI-5 and Informal Inference Assessment (using 3 pictures)	<p>Claude began with the word identification portion of the QRI-5. He performed independently at the pre-primer, primer, and first levels. His instructional level for word identification was the Second Level. Claude then read a Level One narrative, "Mouse in the House" and retold the events/answered comprehension questions. While he made very few miscues, several of his answers to the comprehension questions seemed tangential. Scores will be calculated and included in Chapter 4.</p> <p>We finished with the Informal Inference Assessment. He appeared to be more attentive during this task compared to the QRI-5; however, he also knew he needed to finish to receive his incentive. Specific results will be included in Chapter 4.</p>	