ABSTRACT

LANCASTER, JESSICA MARGARET. Teaching Comprehension Monitoring Strategies within a Metacognitive Framework: An Analysis of the Effects on Fourth Graders’ Reading Achievement and Calibration (Under the direction of Dr. Jessica DeCuir-Gunby and Dr. DeLeon Gray).

Given recent calls for integrating metacognitive strategy instruction in classrooms and current models of self-regulated learning that emphasize the importance of skilled metacognitive monitoring throughout the reading process (Azevedo, 2009a; de Bruin, & van Gog, 2012; Dent & Hoyle, 2015), this study investigated the effects of metacognitive strategies instruction and training in the use of confidence estimates upon fourth graders’ reading achievement and calibration. Over the course of one school year, students in two sections of 4th Grade English Language Arts (ELA; N = 30) received metacognitive strategy instruction designed to support comprehension monitoring. During the final quarter of the school year, these students received explicit instruction in using confidence estimates as an additional tool for comprehension monitoring. Students in two other sections of 4th Grade ELA (N = 33), received standard reading instruction that did not emphasize metacognitive strategies instruction. All participants learned about informational text structures during the same 5-week period (N = 63), but students in the treatment group continued learning about metacognitive reading strategies and received calibration training using confidence estimates. Scores from standardized reading assessments were used to examine the impact of metacognitive strategies instruction and monitoring training upon treatment students’ reading achievement in comparison to the control group. Students in the comparison group scored significantly higher (N = 30, M = 445.80, SD = 5.43) on the 3rd Grade Reading EOG than those in the metacognitive group (N = 33, M = 439.39, SD = 11.98). Regression analysis indicated that higher prior year achievement was associated with better performance on the 4th Grade EOG. Together, prior year achievement and condition accounted
for 67% of the variance in 4th grade standardized test scores. Struggling readers in the treatment group demonstrated significantly greater mean achievement gains ($n = 15$, $M = 13.47$, $SD = 5.08$) than those in the comparison group. Students in the treatment group became significantly less biased (i.e., more calibrated) than those in the comparison group.
Teaching Comprehension Monitoring Strategies within a Metacognitive Framework: An Analysis of the Effects on Fourth Graders’ Reading Achievement and Calibration

by

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A dissertation submitted to the Graduate Faculty of North Carolina State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Educational Psychology

Raleigh, North Carolina 2018

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DEDICATION

This paper is dedicated to my family who has stood strongly beside me and provided unwavering support throughout my journey through this exciting life. This paper is for my Mom and Dad for their enduring support, encouragement, patience and LOVE! I love you more than you will ever know! This paper is for my brother, without whom, I would not be who I am today. He has shown me to be thankful for the blessings that are ever-present in my life. He leads by example in his walk with Christ, his dedication to his beautiful family, and his strong work ethic. This paper is for my son, Tyler, who gave up immeasurable amounts of time with me while I worked on writing. Tyler, I will never forget the fun you had playing games in the DH Hill Library’s gaming room while Mommy worked! I will always remember the heart you painted in the Free Expression Tunnel that had Tyler + Mommy neatly sketched in bright red paint in its center. We have lots of fun memories from our days on campus that we will share forever. I love you! This paper is also dedicated to Dr. Jessica DeCuir-Gunby who never once doubted my ability to finish this project. I am grateful for your time, expertise, and willingness to stick by me throughout this process that stretched beyond the typical time-line. Your compassion is second to none. Thank you.
BIOGRAPHY

Jessica was born in Greensboro, North Carolina on May 28, 1979. She spent her first year with her parents and six-year old brother, Clay, in an apartment on West Market Street in Greensboro. It was not long before the family purchased a home in Kernersville. The home was in a nice neighborhood and Jessica and her brother enjoyed playing with new friends. Jessica soon began kindergarten and loved school and her teachers. As she progressed to higher grades, it became evident that she was focused and serious about her schoolwork.

In 1985, the company Jessica’s dad worked for in Kernersville closed resulting in the family relocating to Jackson, Tennessee for her dad’s new job. The move was difficult for Jessica and her brother because of all the friends they would miss; however, it was not long before both found new friends at school and in the neighborhood where Jessica’s mom and dad had a new house built. The new house had an extra room over the garage that soon became the perfect classroom for Jessica to teach her stuffed animals. She had a desk and blackboard, and it was there at age six that Jessica knew she wanted to be a teacher.

Fast forward to 1991, and a final relocation to Apex, North Carolina where Jessica finished high school and later graduated from Meredith College magna cum laude in 2001 with a BA in Psychology and K-6 licensure. After graduation, Jessica taught elementary school for six years while earning her master’s degree in Elementary Education at NC State. After this, she began full-time study at NC State to work on her PhD in Educational Psychology. During this time, Jessica held positions as a Research Assistant, Teaching Assistant, and later as a Research Associate at the Friday Institute. Familial obligations required returning to work full-time shortly
after finishing her coursework for the PhD. Naturally, she returned to teaching elementary school while finishing her dissertation.

After many years of hard work and dedication, Jessica will graduate with a PhD in Educational Psychology. Wouldn’t you know, she now wants to earn a master’s degree in statistics? Her love for learning and school never ends!
ACKNOWLEDGMENTS

I would like to express utmost gratitude to Dr. Jessica DeCuir-Gunby for her unyielding support, patience, guidance, and encouragement. Without her, I would not be where I am today. I would also like to thank Dr. DeLeon Gray for his invaluable feedback throughout this project. His expertise and willingness to help me refine my writing is greatly appreciated. Dr. Gray took time out of his evenings to meet with me as I worked through the analyses. I truly appreciate his commitment and dedication to helping me get this project completed. I would also like to acknowledge each of my other committee members including Dr. Roger Azevedo, Dr. Margareta Thomson, and Dr. Dale Schunk, all of whom contributed valuable feedback and direction as I worked through this project. Finally, I would like to acknowledge Dr. John Nietfeld, who first introduced me to the field of metacognition in 2006. He and I spent many hours brainstorming ideas for research projects related to metacognition and young children. His excitement about metacognition and his dedication to improving students’ learning outcomes via teaching metacognitive strategies inspired me to follow in his footsteps. Because of his tutelage and our collaboration on several projects focused upon metacognition and learning, I have grown as a teacher and researcher.
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CHAPTER 1: Introduction

Comprehension monitoring is a metacognitive process that involves evaluating one’s understanding of written texts (Baker & Beall, 2009a; Huff & Nietfeld, 2009). Comprehension monitoring is fundamental to reading because it is required for activating metacognitive regulation and control processes that can improve comprehension and, in turn, promote self-regulated reading (Dunlosky & Metcalfe, 2009; Hacker, Dunlosky, & Graesser, 2009a; Ozuru, Kurby, & Mcnamara, 2012; Winne, 2014). Moreover, monitoring can guide readers in applying other comprehension strategies that aid in both constructing meaning and monitoring comprehension (Honig, Diamond, & Gutlohn, 2008).

Strategy instruction that integrates declarative, procedural, and conditional knowledge supports students’ development of metacognition and self-regulation (Randi & Corno, 2005). In this study, I drew upon the theories of social-cognition, metacognition, and self-regulated learning (SRL) to design literacy instruction for two classes of fourth grade students. Students were immersed in an instructional environment intentionally designed using a metacognitive framework grounded within social cognitive learning theory. Using a metacognitive framework to teach reading supports children's development of metacognitive and SRL processes and enhances reading self-efficacy (Schunk & Rice, 1993), all of which are predictors of academic achievement (Baker & Beall, 2009a; Schunk & Pajares, 2002; Schunk & Zimmerman, 2007; Schunk, Meece, & Pintrich, 2014). Given calls for additional classroom-based studies examining the application of metacognitive strategy instruction (Panadero, 2017) and specific recommendations for more longitudinal studies in this area (Caprara et al., 2008; Karabenick & Zusho, 2015) investigating the effects of such instruction on learners’ achievement, the present study investigated the effects of teaching metacognitive strategies, with an emphasis upon
metacognitive monitoring, over an entire school year on fourth graders’ reading comprehension achievement and calibration accuracy.

Statement of the Problem

Many students in the United States fall behind in reading achievement. For example, results from the 2015 National Assessment of Educational Progress revealed only 35 percent of fourth graders, 32 percent of eighth graders, and 36 percent of twelfth graders in the Nation’s public schools scored at or above proficient in reading (National Center for Education Statistics, 2013). Scores for students in targeted subgroups including those eligible for Free and Reduced Lunch (FRL), students with disabilities (SWD), and English Language Learners (ELLs) are more alarming. Among students eligible for FRL, just 21 percent of fourth and 20 percent eighth graders scored at or above proficient in reading. Twelve percent of fourth graders and seven percent of eighth graders with disabilities demonstrated at or above grade level proficiency. Among ELLs, a mere eight percent of fourth grade students and three percent of eighth grade students were proficient in reading (National Center for Education Statistics, 2013).

National deficits in reading scores are alarming, and research suggests more startling outcomes for struggling readers. For example, students struggling in reading at the end of first grade rarely acquire grade level reading skills by the end of elementary school (Foorman, Francis, Fletcher, Schatschneider, & Mehta, 1998; Francis, Shaywitz, Stuebing, Shaywitz, & Fletcher, 1996; Honig et al., 2008; Torgesen, 2004; Wanzek, Wexler, Vaughn, & Ciullo, 2010). Children who are not proficient at reading grade-level texts by the end of third grade are four times more likely to drop-out of high school (Hernandez, 2011). Additionally, struggling readers may be at a higher risk for academic, emotional, and behavioral difficulties while simultaneously feeling less motivated and engaged in school (Hernandez, 2011; Joseph & Schisler, 2006). A
downward spiral of reading failure is extremely difficult for students to overcome (Torgesen, 2004). Described by Stanovich (1986) as the "Matthew effects," students who master reading skills early on get increasingly “richer” in reading ability, while non-proficient readers get increasingly “poorer.” Longitudinal and international studies suggest a pervasive presence of Matthew effects among struggling readers and students with learning disabilities (Sideridis, 2011). However, teachers can provide effective interventions (Scammacca et al., 2007).

Effective readers are skilled in using metacognitive strategies, and teaching students how to read strategically is linked to improved comprehension (Almasi & Fullerton, 2012; Block & Pressley, 2002; Donker, de Boer, Kostons, van Ewijk, Dignath, & van der Werf, 2014; Kostons & van der Werf, 2015; Pressley, Mohan, Raphael, & Fingeret, 2007; Spörer, Brunstein, & Kieschke, 2009). Results from intervention studies aimed at increasing students' reading achievement through training in metacognitive and self-regulatory processes are promising (Dignath, Buettner, & Langfeldt, 2008; Donker, de Boer, Kostons, Dignath van Ewijk, & van der Werf, 2014); however, consistent integration of these processes in daily instructional pedagogy and curricula have yet to be fully realized (Afflerbach, Cho, & Kim, 2011; Ganske & Fisher, 2010; Ness, 2011; Pressley, 2000; Taylor, Pearson, Peterson, & Rodriguez, 2003). Without explicitly teaching children how to read in a metacognitive and self-regulated manner they are left to figure out this daunting process on their own. Some children will succeed, but others may not. Those who remain unskilled in metacognition and self-regulation may exhibit lower academic achievement and reduced academic engagement (Schunk & Greene, 2017).
Purpose of the Study

The purpose of this research was to examine the effects of using a metacognitive framework to teach reading on fourth graders' reading achievement and calibration accuracy compared with students who received regular reading instruction. The treatment group received instruction designed to support their development of strategic reading skills through explicit teaching of metacognitive and self-regulatory processes. The comparison group received instruction focused on reading skills and strategies without explicit teaching of metacognitive and self-regulatory processes.

Findings from earlier studies indicate that students of all ages (Dunlosky & Lipko, 2007) from children (de Bruin, Anique B H, Thiede, Camp, & Redford, 2011; de Bruin, Anique B H & van Gog, 2012) to college students (Pressley & Ghatala, 1990) have difficulty with accurately monitoring their comprehension. Students may be under- or overconfident in judging the extent to which adequate comprehension has occurred. A significant lack of monitoring accuracy (i.e., calibration accuracy) might lead to reduced reading achievement, in part, because of its role in activating metacognitive control processes that stimulate engagement in self-regulated reading processes (de Bruin & van Gog, 2012; Hacker, Dunlosky, & Graesser, 2009b; Schmitt & Sha, 2009; Stolp & Zabrucky, 2009). Furthermore, inaccurate comprehension monitoring may inhibit the use of additional strategies, which not only threatens adequate understanding but also affects decisions to utilize additional comprehension strategies.

In the present study, comprehension monitoring was the foundational reading strategy upon which all other comprehension strategies were based. The primary goal was to test the hypothesis that metacognitive strategy instruction emphasizing comprehension monitoring would increase students’ reading achievement. Findings from a related study by a colleague and I
suggest that integrating process- and response-oriented approaches when teaching metacognitive monitoring might lead to greater accuracy (Huff & Nietfeld, 2009). Therefore, a second goal of this research was to test the hypothesis that integrating process- and response-oriented approaches to teaching metacognitive monitoring would improve students’ calibration accuracy.

**Background and Context**

The release and wide circulation of *A Nation at Risk* in 1983 by the National Commission on Excellence in Education strongly criticized the quality of American education stating, “the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people” (US Department of Education, 1983). This report spawned widespread concern about the quality of America’s schooling among parents and policy-makers. The report spurred school reform movements across the United States and garnered researchers' attention.

Following the release of *A Nation at Risk* (*National Commission on Excellence in Education, 1983*), numerous studies focused on improving student achievement through instructional programs and interventions. Throughout the 1980s, researchers interested in examining reading comprehension used metacognitive theory as a guide for designing interventions aimed at improving reading outcomes (Baker, 1984; Forrest-Pressley, Waller, & Pressley, 1989; Palincsar & Brown, 1984; Paris, Lipson, & Wixson, 1983; Paris & Jacobs, 1984). Research in this area continues to accrue (Block & Parris, 2008; de Boer, van Ewijk, Dignath, Kostons, van der Werf, & Donker, 2014; Kostons & van der Werf, 2015; Liebfreund & Conradi, 2016; Pressley & Allington, 2015b) as state (i.e., North Carolina Read to Achieve Act, 2013; North Carolina State Board of Education, 2014) and national (i.e., No Child Left Behind Act of 2001 [2002]; Elementary and Secondary Education Act, 2010) legislation tighten student,
teacher, and school accountability. Recent wide-spread adoption of more rigorous reading standards (i.e., Common Core State Standards for English Language Arts, 2010) and growing concerns about U.S. students’ stagnant reading scores add to continued interest in studying how classroom teachers can best facilitate students’ application of strategic reading processes.

Given the value of teaching children how to use metacognitive strategies to improve comprehension it is surprising that this type of instruction is not more common in elementary schools. Why aren’t more teachers using a strategy-based approach to teach reading? Multiple factors likely contribute to the issue. First, researchers have found that teaching strategic text processing can be challenging (Almasi & Fullerton, 2012; Duffy, 2009; Duke & Block, 2012; Pressley, Goodchild, Fleet, Zajchowski, & Evans, 1989). Another issue is that some of the well-known strategy programs are time consuming for teachers to learn and implement, and tools and curriculum materials that promote metacognition and self-regulation are not readily available to teachers (Block, Parris, Reed, Whiteley, & Cleveland, 2009). Finally, constraints on strategy instruction may relate to state and national educational reform initiatives that have placed accountability at the forefront through high-stakes assessments (Afflerbach, Cho, Kim, Crassas, & Doyle, 2013).

For example, the North Carolina Read to Achieve Program ([RtA]; Session Law 2012-142, House Bill 950, Section 7A, General Statute 115C-83.1A-I) mandates retention for most children who do not pass a standardized reading test at the end of third grade. At the national level, one of the most sweeping accountability statutes is the No Child Left Behind Act (NCLB) of 2001 (U.S. Department of Education, 2002), which imposes sanctions on schools that do not meet Annual Measurable Objectives (AMOs) for federally identified subgroups of students. Additionally, NCLB set the expectation that all schools have 100 percent of students proficient
in reading and math by the end of the 2013-14 school year. Other national reform initiatives pushing greater accountability include the Race to the Top Program (U.S. Department of Education, 2009) and the Elementary and Secondary Education Act (ESEA; U.S. Department of Education, 2010). Components of these reforms often leave students and their teachers feeling tremendous pressure to succeed on high-stakes assessments. As a result, teachers might feel compelled to ‘teach to the test’ (Popham, 2001; Volante, 2004) rather than engage in metacognitive and self-regulative pedagogy. The next two sections describe recent changes in North Carolina’s testing and accountability model, which have raised the stakes for elementary school students and their teachers.

**The North Carolina Read to Achieve Program**

Recent legislative changes to North Carolina's testing and accountability model increase the stakes for student promotion after third grade. Signed into law in 2012 and enacted beginning with the 2013-14 school year, the primary goal of the North Carolina Read to Achieve (RtA) program is to ensure that every student in the state reads at or above grade level by the end of 3rd grade (G.S. 115C-83.1A-1). The law mandates retention for students who are not proficient on state approved standardized tests of reading comprehension at the end of their 3rd grade year, unless they qualify for a good cause exemption. Good cause exemptions are provided for students meeting at least one of the following five criteria: (1) Limited English Proficient (LEP) with less than two years of instruction in English as a Second Language (ESL) program; (2) documented learning disability with an individualized education plan (IEP) that includes alternate reading assessments and interventions; (3) retained more than once; (4) demonstrated reading proficiency through a reading portfolio; and (5) demonstrated reading proficiency on standardized tests or other assessments approved by the State Board of Education. Children with
a good cause exemption are placed in 4\textsuperscript{th} grade and must receive extra instructional support services and research-based reading interventions from the classroom teacher. Figure 1 shows RtA action steps as children complete third grade.
**Figure 1.** Procedures for students upon completion of third grade under North Carolina’s Read to Achieve program

*Source: North Carolina Read to Achieve Guidebook (2013, North Carolina State Board of Education)*
As illustrated on the left side of Figure 1, students who do not show proficiency of third grade reading standards on the North Carolina READY Reading End-of-Grade Test (Reading EOG) begin a process that could lead to retention. Children who qualify for a good cause exemption move on to fourth grade and must receive additional instructional supports, services, and research-based interventions (G.S. 115C-83.1A-I). Students who pass a re-administration of the Reading EOG or the alternative Read to Achieve Test (RtA Test) go on to fourth grade. Otherwise, students may attend a six-week remedial summer reading camp with promotion to fourth grade contingent upon proficiency on a second administration of the RtA Test at the end of camp or successful completion of a standardized reading portfolio. Children who are still not reading at grade level by the end of reading camp are placed into either a 3-4 transition class or an accelerated class\(^1\) but are labeled as retained in third grade reading. The process for students placed into either setting is presented in Figure 2.

\(^1\) Local school districts have discretion over the type of class. Reading interventions occur within transition classes. Interventions are provided as a pull-out service in the accelerated class setting.
Figure 2. The process of retention under the North Carolina Read to Achieve program

As shown in Figure 2, transition teachers teach fourth grade ELA standards while also remediating reading difficulties through research-based reading interventions. Transition students can achieve mid-year promotion by passing another administration of the RtA Test, scoring a Text Reading Comprehension (TRC) of at least Level P (i.e., Level P is grade level at the end of third grade) measured via standardized assessments in mCLASS: Reading3D, or by completing a standardized reading portfolio. The reading portfolio consists of three third third-grade reading passages and five multiple-choice questions per standard. Those who show proficiency of third grade reading standards via the standardized portfolio or by attaining a TRC score of at least Level P by the end of fourth grade will have the retained reading label removed from school records. All transition students, regardless of RtA proficiency status, are required to take the Fourth Grade Reading EOG test. Principals make final promotion and retention decisions at the end of fourth grade.

**The North Carolina READY Accountability Model**

In addition to increased stakes associated with RtA, the North Carolina State Board of Education (NCSBE) raised the minimum score requirements for proficiency beginning with the 2012-13 administration of the Reading EOG. Changes to scale score ranges and approximate minimum raw scores for each achievement level are summarized in Table 1. Information is provided in the table for Grades 3-5 for comparison purposes. Note the change in the number of achievement levels from four to five beginning with the 2014-15 school year. This change occurred in March 2014 when the NCSBE recalibrated the number of achievement levels from four to five. Members of the NCSBE reasoned that using five achievement levels, as opposed to four, would provide more definitive discrimination about student achievement and enable more
precise identification of students who need additional instruction and assistance. Descriptions of the five achievement levels are provided in Table 2.

Table 1

North Carolina READY End-of-Grade English Language Arts/Reading General Test

Specifications by Year for Grades 3-5

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<td></td>
<td></td>
<td></td>
<td>(26-27)</td>
<td>(32)</td>
<td>(34-35)</td>
<td>(41-42)</td>
</tr>
<tr>
<td>5</td>
<td>2012-13</td>
<td>44</td>
<td>≤442</td>
<td>443-452</td>
<td>453-463</td>
<td>≥464</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(25)</td>
<td>(34)</td>
<td>(41)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2013-14</td>
<td>44</td>
<td>≤442</td>
<td>443-449</td>
<td>450-452</td>
<td>453-463</td>
<td>≥464</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(24-25)</td>
<td>(31)</td>
<td>(34)</td>
<td>(40-41)</td>
</tr>
</tbody>
</table>

Note. Numbers in parentheses are minimum raw scores or raw score ranges.

Source: NCDPI/North Carolina Testing Program (2014)
Table 2

North Carolina READY End-of-Grade English Language Arts/Reading Achievement Level Descriptors

<table>
<thead>
<tr>
<th>Achievement Level</th>
<th>Command of Knowledge and Skills</th>
<th>Meets Grade Level Proficiency Standard</th>
<th>Meets College-and-Career Readiness Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Superior</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Solid</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Sufficient</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Partial</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1</td>
<td>Limited</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: NCDPI/North Carolina Testing Program (2014)

The Common Core State Standards for Reading

In line with federal and state legislation discussed in the previous sections, students across much of the United States face pressure to demonstrate mastery of more rigorous academic standards established by the Common Core State Standards (CCSS). The Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects (the Reading Standards) require students to read and comprehend more complex texts than they have customarily been expected to tackle. The Reading Standards also call for teachers and students to spend more time working with informational texts. Greater text complexity and an increased focus on informational texts present unique challenges for some students.

Text Complexity

A major goal of the Common Core Standards for Reading is that students graduate high school able to comprehend sufficiently complex texts to increase the likelihood of success in
college, throughout careers, and within society (Common Core State Standards: Appendix A, 2014). While reading demands in colleges, workforce training programs, and society have generally risen over the past half century, they have become less demanding throughout K-12 schooling (Common Core State Standards: Appendix A, 2014). Additionally, prior to implementing the Reading Standards, little attention has been given to students’ ability to independently comprehend complex texts during K-12 schooling, furthering the gap between high school graduates’ reading ability and the demands of reading they will encounter post-graduation. Therefore, the Reading Standards emphasize text complexity from kindergarten through twelfth grade.

Text complexity is addressed in Reading Standard 10, which states that students should be able to “Read and comprehend complex literary and informational texts independently and proficiently by the end of twelfth grade” (Common Core State Standards: Appendix A, 2014). Standard 10 is organized in a staircase fashion of progressively increasing text complexity with levels ranging from beginning reading to college and career readiness (Common Core State Standards: Appendix A, 2014). Text complexity is evaluated using a three-part model that combines quantitative and qualitative measures, as well as reader and task considerations. Quantitative measures analyze features of text difficulty such as word length or frequency, sentence length, and text cohesion. Qualitative evaluation of text complexity involves judging levels of meaning or purpose within a text, its structure, language conventionality and clarity, and knowledge demands required of a text. Reader and task considerations include attending to individual student factors such as cognitive capabilities, motivation, knowledge, and experiences, while also determining specific task features such as goals and complexity.
Text complexity is arranged in grade bands (see Table 3). By the end of the first year in a grade band, students are expected to independently read and comprehend texts within the given range, and work with texts at the high end of difficulty with appropriate scaffolding. By the end of the last year in a grade band, students are expected to read and comprehend texts within the specified range, including the high end, independently and proficiently.

A comparison of text level expectations prior to and following implementation of the Reading Standards is presented in Table 3. As shown, an increase in text complexity begins within the Grade 2-3 band, where the upper end Lexile level is 65 points higher within the Reading Standards in comparison to previous expectations. Further, the entire table shows how text complexity progresses in a staircase fashion reflecting the requirement that students tackle increasingly more challenging texts as they move through each grade band.

Table 3

<table>
<thead>
<tr>
<th>Grade Band</th>
<th>Old Lexile Levels</th>
<th>College and Career Readiness Lexile Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2-3</td>
<td>450-725</td>
<td>450-790</td>
</tr>
<tr>
<td>4-5</td>
<td>645-845</td>
<td>770-980</td>
</tr>
<tr>
<td>6-8</td>
<td>860-1010</td>
<td>955-1155</td>
</tr>
<tr>
<td>9-10</td>
<td>960-1115</td>
<td>1080-1305</td>
</tr>
<tr>
<td>11-CCR(^1)</td>
<td>1070-1220</td>
<td>1255-1355</td>
</tr>
</tbody>
</table>

Note: \(^1\)CCR = College and Career Readiness

Source: Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects, Appendix A (2012)
**Informational Text**

The Reading Standards emphasize the importance of informational text comprehension for increasing students’ understanding of academic and domain-specific concepts. Students work with informational texts beginning in kindergarten and continue to spend more time working with them as they progress through elementary school and beyond. Accordingly, there are three critical instructional shifts (Appendix A, 2014), which are summarized in Table 4.

First, students must build knowledge through reading content-rich informational texts. This is accomplished by ensuring that students read more nonfiction across content areas, teaching how nonfiction texts can be structured, discussing features of informational texts, and studying primary source documents. Second, students are required to use evidence from the text to support written and oral responses. They need guidance from teachers to learn how to effectively use text-based evidence to support arguments, form judgments, and compare ideas across multiple texts. Finally, students need frequent opportunities to practice reading complex texts and working with associated academic vocabulary. The changes in instructional foci associated with the Reading Standards accentuate the need for teaching students how to approach complex texts strategically.
Table 4

Critical Shifts in Instructional Foci and Expectations for Students within the Common Core State Standards for Reading in Grades 3-5

<table>
<thead>
<tr>
<th>Shifts</th>
<th>Student Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Build knowledge through content rich nonfiction and informational texts.</td>
<td>• Read more informational texts.</td>
</tr>
<tr>
<td></td>
<td>• Discuss details of informational texts.</td>
</tr>
<tr>
<td></td>
<td>• Increase knowledge in Science and Social Studies through reading informational texts.</td>
</tr>
<tr>
<td></td>
<td>• Read primary source documents.</td>
</tr>
<tr>
<td>2. Read, write, and discuss using evidence from the text.</td>
<td>• Find evidence to support arguments, discussions, and writing.</td>
</tr>
<tr>
<td></td>
<td>• Form judgments based on text-based evidence.</td>
</tr>
<tr>
<td></td>
<td>• Become scholars.</td>
</tr>
<tr>
<td></td>
<td>• Compare multiple texts through writing.</td>
</tr>
<tr>
<td>3. Regularly engage in practice reading complex texts and its academic vocabulary.</td>
<td>• Read material at independent reading level, and work with more challenging texts.</td>
</tr>
<tr>
<td></td>
<td>• Handle frustration and keep pushing.</td>
</tr>
<tr>
<td></td>
<td>• Unpack texts.</td>
</tr>
<tr>
<td></td>
<td>• Learn vocabulary that will be useful in college and careers.</td>
</tr>
</tbody>
</table>

Significance of the Study

The pervasive need to improve students’ reading comprehension resonates as a national priority (Common Core State Standards Initiative, 2012a; National Reading Panel [NRP, 2000]; Snow, 2002; National Institute of Child Health and Human Development, [NICHD], 2000). With North Carolina’s recent adoption of the Common Core Reading Standards, which are more rigorous than previously implemented curriculum, coupled with changes in the state’s testing program that increase both performance expectations and stakes tied to promotion, teachers are expected to consistently implement research-based instructional practices to support children’s growth in literacy.
An inherent part of this dissertation is not only the opportunity to test the impact of an intervention specifically designed to enhance children’s reading achievement through immersing them in an instructional environment focused on improving their metacognitive and self-regulated reading skills, but to also provide insight into the interconnections among metacognitive monitoring and control, self‐regulation, self‐efficacy beliefs, and strategic reading processes. This study complements prior investigations and aims to deliver an integrated view of three paradigms noted as influential components of students’ achievement in reading. Additionally, positioning this research within a dynamic elementary school classroom is timely, as it stands to make a significant contribution to the existing literature which includes a greater proportion of studies undertaken with young adults in undergraduate college courses or in tightly controlled laboratory type settings. Findings from this investigation will contribute to theory by further delineating the interrelationships among metacognition, self‐regulation, and self‐efficacy with a specific evaluation of the links between metacognitive oriented reading instruction and calibration training upon reading achievement. Finally, it is hoped that this study will provide pragmatic instructional tools to educators who are committed to helping all children achieve growth in reading comprehension.
Study Overview

This study investigated the effects of metacognitive strategy instruction that emphasized comprehension monitoring on fourth grade students’ reading achievement and calibration accuracy. Students in two fourth grade English Language Arts/Social Studies (ELA/SS) classes ($N = 33$) formed the treatment group and received comprehension strategies instruction grounded within the theories of social cognition, metacognition, and self-regulated learning. Comprehension monitoring was presented and taught as the foundational reading strategy upon which all other strategies were based and built upon. Students were taught a variety of strategies for self-monitoring their comprehension. During the last quarter of the school year, they received direct instruction about the use of confidence judgments as an additional tool to monitor text comprehension. This training coincided with a five-week informational text structures unit. Throughout the five-week unit, students in the treatment group received process- and response-oriented feedback from the teacher-researcher regarding their use of confidence estimates as a metacognitive monitoring tool.

Students in two additional fourth grade ELA/SS classes ($N = 30$) within the same school served as the comparison group and received their teacher’s regular reading instruction. All participants ($N = 63$) completed the same informational text structures unit spanning five weeks during the final quarter of the 2014-15 school year. The unit was planned collaboratively by the two ELA teachers as part of a school-wide professional development requirement. All participants provided confidence estimates on assignments used throughout the informational text structures unit.

Based upon previously discussed research, this study addressed two primary objectives. The first goal was to assess the extent to which comprehension strategy instruction emphasizing
metacognitive monitoring skills impacts fourth grade students’ reading achievement as measured by standardized reading assessments. The second objective of this research was to evaluate the effects of monitoring accuracy training on students’ calibration. This training utilized response and process-oriented feedback in light of findings from a study by the first author and her colleague (Huff & Nietfeld, 2009). To meet the primary objectives of this study, the following hypotheses were tested:

1. Metacognitive monitoring instruction will significantly increase reading achievement in fourth grade students.

   H1a: While growth in reading achievement is expected across both groups, it is hypothesized that students who receive reading instruction using a metacognitive framework will show larger gains in reading achievement compared with those receiving standard reading instruction.

   H1b: Based on previous findings that struggling readers especially benefit from interventions using metacognitive strategies, it is further hypothesized that achievement gains among struggling readers in the metacognitive group will be significantly greater compared with other participants.

2. Metacognitive monitoring instruction including training in the use of confidence estimates will increase fourth grade students' calibration accuracy as compared to students who do not receive monitoring instruction.

   H2a: Based upon prior evidence, it is hypothesized that reading proficiency level (struggling versus non-struggling) will moderate the relationship between instruction in the use of confidence estimates and calibration accuracy.
Summary

Increased academic rigor set forth by the Common Core Reading Standards, more stringent requirements for demonstrating reading proficiency on state tests, and higher stakes tied to promotion signify the importance of further fleshing out links between research-based instruction and reading achievement. While positive results have emerged from investigations aimed at increasing students' reading achievement and motivation through training in strategic reading processes, widespread implementation of this type of instruction in elementary classrooms and its integration throughout the curriculum have yet to be realized on a large-scale level. Without explicitly teaching children how to read strategically, they are left to figure out this complex process on their own. Some students will succeed independently, but many others may not, which could lead to reduced achievement across academic domains.

Nearly four decades of evidence highlight the role of self-monitoring in both metacognition and self-regulated learning (SRL). Links between these constructs and increased reading achievement have been established; however, there is a need for additional work in this area among elementary school children who, compared with older students, are underrepresented in much of the related literature. Furthermore, a large proportion of studies have investigated these constructs within tightly controlled laboratory settings, often in conjunction with college courses, which may limit generalizability and ecological validity of results applicable to younger students within complex classroom environments.

Recent state and federal educational reform programs require mastery of tougher reading standards, along with tighter student, teacher, and school accountability. Reform initiatives at both the state and national level have recently tied accountability to high-stakes assessments. For example, in North Carolina, children as young as 8 years old experience the pressures associated
with passing standardized tests, which have substantially increased in cognitive rigor. Teaching young readers to approach reading in a metacognitive and self-regulated manner is a powerful instructional method that teachers can use to support students as they strive to master more challenging reading standards.
Chapter 2: Review of the Literature

One of the most important outcomes of schooling is the ability to successfully construct deep or critical meaning from texts (Minguela, Sole, & Pieschl, 2015; Pressley & Afflerbach, 1995; Pressley, Graham, & Harris, 2006a). However, as pointed out in the introductory chapter, only about one-third of our Nation’s fourth, eighth, and twelfth graders are reading at or above proficient status (NAEP, 2015). Encouraged by the Common Core State Standards for Reading and as heralded among literacy researchers, educators in K-5 settings must utilize evidence-based teaching practices to help students develop comprehension skills and strategies (Diamond, 2012; Jitendra, Burgess, & Gajria, 2011; Pressley, Gaskins, Solic, & Collins, 2006). Situating reading instruction within a metacognitive framework is a key theme in related literature, and findings support its fundamental role in reading achievement (Callender, Franco-Watkins, & Roberts, 2016; Coppins, 2013; Dunlosky & Lipko, 2007; Honig et al., 2008; Stolp & Zabrucky, 2009).

Within a metacognitive instructional framework, students learn how to regulate and control comprehension processes. In the present study, the approach used to teach reading in the treatment condition drew upon metacognitive and self-regulated learning theories with an emphasis on the processes of monitoring and control for effective regulation of reading comprehension. Evidence suggests that comprehension monitoring is one of the most important reading strategies to teach young learners (Kolic-Vehovec, Zubkovic, & Pahljina-Reinic, 2014). This is because monitoring is required for activating metacognitive regulation and control processes that, in tandem, improve comprehension (Roebers, 2017; Schunk & Greene, 2017; Stolp & Zabrucky, 2009; Winne, 2011).
This literature review emphasizes the importance of integrating metacognitive strategy instruction within upper grade elementary school classrooms, along with the need to evaluate the effectiveness of such integration in comparison to traditional reading instruction in terms of students’ monitoring and achievement. Three primary arguments are presented that support the need for this research and my decisions about chosen methodologies:

1. The integration of metacognitive strategy instruction is essential to support children’s development of key metacognitive and self-regulatory processes (Azevedo, 2009a; Roebers, 2017; Schunk & Greene, 2017).

2. Social cognitive learning theory provides a solid conceptual framework in which to implement strategy instruction designed to improve children’s comprehension, metacognition, and self-regulation (Bandura, 1986b; Schunk & Greene, 2017; Zimmerman & Moylan, 2009; Zimmerman & Schunk, 2011).

3. There is a fundamental need to evaluate how an integrated approach to metacognitive strategy instruction and monitoring accuracy training affects students’ growth in reading achievement (Pressley & Allington, 2015a; Roebers, 2017).

This chapter begins with a description of theories that guided the instructional framework used to teach reading comprehension in the treatment group. Next, an examination of research on comprehension strategy instruction at the elementary school level is presented. Research on metacognitive and self-regulatory reading strategies in comprehension instruction is discussed with further elaboration on children’s development of metacognitive and self-regulatory reading processes, as well as an analysis of individual differences. The review concludes with a summary of the research and a description of how this study addressed gaps identified in the literature.
Theoretical Framework

This study was guided by the theories of social cognition, self-regulation, and metacognition because of influential components from each paradigm upon children’s development of strategic reading comprehension skills. Instructional methods used to teach reading in the treatment classrooms were grounded in social cognitive learning theory (Bandura, 1986a; Bandura, 1986b; Martin, 2004; Schunk, Meece, & Pintrich, 2012). Pedagogical approaches also drew upon metacognitive and self-regulated learning models of reading comprehension that centralize monitoring processes for effective regulation and control of text comprehension (de Bruin & van Gog, 2012; Greene & Azevedo, 2007; Hacker et al., 2009a; Israel, Block, Bauserman, & Kinnucan-Welsch, 2005; Koriat, 2012; Winne, 2018).

Self-regulatory processes are key aspects of social cognitive learning theory and are activated when a person’s comparison of performance with previously self-determined goals reveals some discrepancy (Bandura & Cervone, 1983; Bandura, 1986a; Schunk et al., 2014). Likewise, metacognitive processes are important components of self-regulated learning (Winne, 2018). Components from each of the guiding theories impact reading comprehension: good readers are strategic, metacognitive, and motivated (Pressley & Wharton McDonald, 1997) in the same way that self-regulated learners are strategic, metacognitive, and motivated (Pintrich, 2000; Winne & Hadwin, 2008). Skilled text comprehension, therefore, is directly supported through metacognitive and self-regulatory processes, which are inherently connected. Social cognitive learning theory forms the framework for analyzing and synthesizing extant research in the areas of self-regulation, metacognition, and instructional interventions in reading.
Social Cognitive Learning Theory

Social cognitive learning theory contends that learning is influenced by reciprocal interactions among personal, behavioral, and environmental variables (Bandura, 1986b). From a social cognitive learning perspective, the development of strategic reading is influenced by cyclical interactions among three factors: (1) personal factors (e.g., students’ prior knowledge of topics addressed in reading selections, reading self-efficacy, and interest); (2) behavioral factors (e.g., students’ strategic approaches to reading and related literacy tasks); and (3) environmental factors (e.g., text/task complexity and classroom context). The triadic reciprocality model of learning is presented in Figure 3.

![Triadic Reciprocality Model](image)

**Figure 3.** Bandura’s model of triadic reciprocal determinism


As shown in Figure 3, Bandura’s social cognitive learning theory specifies reciprocal interactions among behavioral, personal, and environmental influences upon cognition. Each component is discussed in the next section which describes a social cognitive model of SRL.
A Social Cognitive Model of Self-Regulated Learning

Zimmerman’s (2000) three-phase cyclical model of SRL is a prominent social cognitive conceptualization of self-regulation (refer to Figure 4). His model of self-regulation follows the tenets of Bandura’s theory discussed in the previous section. Zimmerman’s model of SRL consists of three phases: the forethought phase, performance or volitional control phase, and the self-reflection phase. Task analysis and self-motivational beliefs begin the forethought phase which precedes learning and prepares the learner for processes associated with the performance or volitional control phase. Task analysis includes goal setting and strategic planning. Key motivational beliefs include self-efficacy, outcome expectations, intrinsic interest and value, and goal orientation. The performance control phase occurs during learning and involves self-control and self-observation. Self-monitoring is an important part of the second phase; it alerts students when progress toward goals is not going as planned. Finally, the self-reflection phase occurs after learning and includes self-judgment and self-reaction regarding the learning outcome. In this phase, learners compare self-monitored information with a goal and assess their success or failure.
Figure 4. Zimmerman’s social cognitive model of self-regulatory phases and processes (Zimmerman & Moylan, 2009)
Characteristics Differentiating Skillful and Naïve Self-Regulation

Skillful self-regulators differ from naïve self-regulators in key ways across the three-phases of self-regulation (Schunk & Zimmerman, 1998; Zimmerman, 1989). During the forethought phase, skillful self-regulators set specific hierarchical goals, adopt a learning goal orientation, have high self-efficacy, and are intrinsically interested in tasks whereas naïve self-regulators set nonspecific distal goals, typically have a performance goal orientation, exhibit low self-efficacy, and have difficulty developing intrinsic interest in tasks. During the performance control phase, naïve self-regulators have an unfocused plan, adopt self-handicapping strategies, and fail to systematically self-monitor their progress, while skillful self-regulators are focused on performance, utilize self-instruction and imagery to guide their learning, and are adept at self-monitoring performance. Finally, during the self-reflection phase, naïve self-regulators avoid self-evaluation, attribute their successes and failures to ability rather than effort, have negative self-reactions, and are generally non-adaptive, whereas skillful self-regulators self-evaluate progress, attribute success and failures to strategy use, have positive self-reactions, and are generally adaptive.

Self-Regulated Learning

Self-regulated learning (SRL) is defined as “self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (Zimmerman, 2000, p. 14). Described by Schunk and Zimmerman (2011) as “the processes whereby learners personally activate and sustain cognitions, affects, and behaviors that are systematically oriented toward the attainment of learning goals” (p. 1), students who are self-regulated self-initiate and self-direct their efforts to learn and actively direct cognitive and motivational processes to reach a learning goal (M. Boekaerts & Cascallar, 2006; Zimmerman & Schunk, 2011; Zimmerman &
Kitsantas, 2005). Self-regulated learners are metacognitively, motivationally, and behaviorally active in their own learning. They are aware of their strengths and weaknesses and can use strategies, flexibly, to meet specific learning goals (Winne & Hadwin, 2000; Zimmerman, 1989).

Students who are skilled in self-regulation control their learning and cognitive resources and have a keen awareness of whether they have mastered learning goals. Self-regulated learners are more likely to succeed academically and have optimistic views of their futures due to their high motivation and adaptive learning approaches (Zimmerman, 2002, p. 66). Self-regulation is predictive of academic achievement (Zimmerman & Kitsantas, 2005; Ablard & Lipschultz, 1998; van de Hurk, M., 2006; Zimmerman & Martinez-Pons, 1986). Research suggests that the more frequently students use self-regulated learning strategies the more likely it is that they will achieve at higher levels (Zimmerman & Martinez-Pons, 1986, 1988). High-achieving students are more likely to engage in effective SRL strategy use than their low-achieving counterparts, but this relationship is complex as Ablard & Lipschultz (1998) found in their study with 222 seventh grade students. Using a self-report questionnaire, they found variation in SRL among high-achieving students. Some high-achievers used a range of SRL strategies, but others did not report using SRL strategies suggesting that some students achieve at high levels without necessarily engaging in SRL strategies. Interpretation of the findings requires caution since data was collected using a self-report questionnaire, thus students may have not reported strategy use.

Various models of SRL highlight different aspects of the construct including volitional aspects (Corno, 2001), cognitive aspects (Winne, 1995), and sociocultural aspects (McCaslin & Hickey, 2001; Paris, Byrnes, & Paris, 2001). Despite the various models, there are four common assumptions among them (Boekaerts & Corno, 2005; Panadero, 2013). First, it is assumed that self-regulated learners actively construct meaning and adapt thoughts, feelings, and actions as
needed to affect learning and motivation. Secondly, biological, developmental, contextual, and individual differences may hinder or support students' efforts at self-regulation. A third assumption is that self-regulated students use standards to direct their learning and set goals. Finally, achievement effects, rather than being directly linked to personal or contextual characteristics, are mediated by self-regulatory activities.

**The Role of Monitoring in Self-Regulated Learning**

According to Zimmerman (1989), “a self-regulated learning perspective shifts the focus of educational analyses from student learning abilities and environments at school or home as fixed entities to students’ personally initiated strategies designed to improve learning outcomes and environments” (p. 1). Thus, all students, regardless of learning differences or environmental influences, are capable of proactively and personally improving their academic learning and achievement outcomes. Consequently, instructional methods and curricula that include SRL principles can enhance academic achievement and motivation for all children, which brings into question the lack SRL integration in recent educational reform initiatives that tighten accountability (e.g., NCLB, 2001; NC RtA, 2012) and reflect rigorous academic standards (CCSS, Appendix A, 2012). Pintrich, 1995 echoed this optimism over 20 years ago when he described self-regulated learning as a skill that can be learned by every student regardless of age, background, ability level, prior knowledge, or motivation (p.8). This was one of the most important goals for me as the teacher-researcher in my classroom where I worked with a group of students who began the school year expressing feelings that they could not learn to read. And so, it became my mission to ensure that all of my students realized that they had the power to control their learning through monitoring and controlling their behaviors, motivation and affect, and their cognition (Pintrich, 1995)
Metacognition

Flavell defined metacognition as “knowledge and cognition about cognitive phenomena” (1986, p. 906) and conceptualized it as comprised of two main components: knowledge of cognition and regulation of cognition. Knowledge of cognition consists of declarative, procedural, and conditional knowledge while regulation of cognition includes planning, monitoring, and evaluating cognitive processes and strategy use. Declarative knowledge involves knowledge of factors that influence learning and performance. Procedural knowledge refers to information about how to use specific strategies. Conditional knowledge includes knowledge of when and why to use specific strategies. Sufficient declarative, procedural, and conditional knowledge is essential for independent selection, application, and toggling strategy use as needed. Within regulation of cognition, planning involves the selection of appropriate strategies aligned to learning goals and allocation of resources accordingly. Monitoring occurs as learners attend to their progress toward goals and make strategic adjustments accordingly. Evaluating consists of reflection about strategies used and subsequent results on given tasks.

Metacognitive knowledge and skills are linked with higher levels of reading comprehension, improved writing, better problem solving, and overall higher achievement. Metacognitive knowledge and skills can be improved through explicit modeling of strategies (Schunk et al., 2014) and use of regulatory checklists (Schraw & Gutierrez, 2015), which help focus students' attention on planning, monitoring, and evaluating while engaged in a learning task.

Models of Metacognition within Reading

Metacognitive models within reading highlight the essential role of comprehension monitoring for effective text understanding (Baker & Beall, 2009; Bercher, 2012; Hacker, 1998).
Comprehension monitoring is a multidimensional process involving two main components: *evaluation* and *regulation* of comprehension (Baker & Beall, 2009b). The evaluation component includes awareness of comprehension difficulties, while the regulation aspect involves decisions to use fix-up strategies to help repair misunderstandings. Realization that what one is reading is not making sense is an important precursor to the deployment of repair strategies that can help correct misunderstandings and lead to more self-regulated reading. The importance of comprehension monitoring is illustrated in Douglas Hacker’s (1998) model of self-regulated comprehension, which centralizes monitoring as a pivotal process necessary for both cognitive and metacognitive levels of reading (see Figure 5).
Figure 5. Hacker’s model of self-regulated comprehension

Monitoring and Control of Reading Processes

Comprehension monitoring, an essential process used by skilled readers, involves ongoing self-appraisals about understanding of a given text which is important for mobilizing fix-up strategies that help repair misunderstandings. Monitoring is an essential component of strategic, self-regulated reading (de Bruin & van Gog, 2012; Dunlosky & Lipko, 2007; Koriat, 2012). Students who exhibit greater monitoring accuracy demonstrate higher reading achievement and more self-regulation compared with those who are less accurate. Accurate monitoring of comprehension while reading can alert students when misunderstandings arise during reading, prompting them to enact strategies to repair these difficulties. If comprehension monitoring is inaccurate or not utilized, readers can lack awareness of the need to use fix-up strategies to repair misunderstandings and; as a result, poorer performance is likely.

Because self-monitoring is an integral part of successful comprehension and self-regulated reading, an expanding area of interest among researchers is examining students’ monitoring accuracy during reading. Accurate monitoring of comprehension during reading alerts students when misunderstandings arise, prompting use of repair tactics to remedy difficulties, which can improve comprehension thus leading to increased reading achievement (Woolley, 2011a). In contrast, inaccurate self-evaluations of comprehension could deter students from engaging in remedial reading behaviors, despite the necessity of doing so, thus leading to reduced comprehension and poorer reading achievement.

People of all ages from children to college students have difficulty with accurately monitoring comprehension (Dunlosky & Lipko, 2007). This is especially evident among students with learning disabilities who have greater difficulty with metacomprehension, and therefore, are typically less calibrated than their non-disabled peers (Kinnunen & Vauras, 1995).
In a review of 22 studies focused upon self-efficacy beliefs and calibration, Klassen (2002) found that students with learning disabilities demonstrate more difficulty with calibrating literacy performance (i.e., reading and writing) than mathematics performance. Certain factors likely contribute to these difficulties. For example, Butler (1996) suggests that difficulties with accurate calibration among students with learning disabilities stems from deficits in metacognitive knowledge, along with their tendency to focus on concrete task demands, leaving them with fewer resources to devote to self-monitoring learning and task performance.

**Measuring Metacognitive Monitoring**

Students’ ability to estimate their performance can be measured via metacognitive judgments (Hacker, Bol, & Bahbahani, 2008; Hattie, 2013; Nietfeld, Enders, & Schraw, 2006; Rutherford, 2017). Metacognitive judgments differ depending upon the time of assessment – that is, on whether they are assessed before or after a test, and according to their grain size – that is, whether they are based upon an entire test or single items (Hacker, Bol, & Keener, 2008).

**Constraints Upon Monitoring Accuracy**

What accounts for children’s difficulties in monitoring during tasks requiring the detection of internal text inconsistencies? Rather than stemming from conceptual or metacognitive deficits, some researchers theorize that children’s difficulties with accurate monitoring stems from developmental limitations in their information-processing (Ruffman, 1996). One idea is that children’s limited working memory capacity could be a key factor constraining their comprehension monitoring. For example, Oakhill, Hartt, & Samols (2005) examined differences in comprehension monitoring among 9 and 10-year-olds classified as either good or poor in comprehension skill finding that skilled readers demonstrated greater monitoring accuracy than poorer readers. In a second study, Oakhill et al. (2005) manipulated the
working memory demands of the monitoring task, finding a positive relationship between working memory and monitoring behaviors on several error-detection tasks; however, comprehension ability remained a good, and sometimes better, predictor of accurate comprehension monitoring.

Other researchers hypothesize that mismatched alignment between judgment context and test context account for poor monitoring accuracy. For example, Dunlosky, Rawson, & Middleton (2005) investigated two hypotheses to examine the common finding of low levels of metacomprehension accuracy including the transfer-appropriate monitoring (TAM) hypothesis and the accessibility hypothesis. According to the TAM hypothesis, accuracy is a function of the match between properties of judgment and test contexts. A mismatch between judgment context and test context could account for poor metacomprehension accuracy. Therefore, alignment between the two contexts should increase accuracy. On the other hand, the accessibility hypothesis suggests that judgment accuracy is a function of the amount of information accessed from memory and criterion performance. Thus, lower accuracy occurs because readers access only a small portion of the to-be-judged-text. The accessibility hypothesis is particularly relevant among studies of global judgments in which individuals make a quick single assessment of their overall comprehension of text material. In their first experiment, Dunlosky et al. (2005), found that term-specific accuracy was significantly greater than global accuracy for immediate judgments when participants were required to make a retrieval attempt. Their second experiment mirrored the first, except that students were asked to judge the accuracy of their pre-judgment recall attempt. Judgments of accurate recall were only moderately accurate and making the judgments did not significantly increase the accuracy of term-specific judgments.
Some theorists suggest that children lack metacognitive knowledge because of an availability deficiency and/or a production deficiency (Winne, 1996). Children who lack the metacognitive knowledge to tackle problems during reading exhibit an availability deficiency. In such cases, strategy instruction must explicitly address metacognitive knowledge. The effectiveness of teaching metacognitive knowledge is established, and interventions related to metacognitive knowledge on performance show moderate effect sizes. Children struggling with metacognitive monitoring due to a production deficiency have metacognitive knowledge but do not effectively use it. Providing such students with external cues, such as prompt cards, is an effective instructional method.

**Reading Comprehension**

Reading comprehension is a multifaceted, complex process that involves extracting and constructing meaning from written texts (Pressley & Afflerbach, 1995). Coherent text comprehension requires readers to simultaneously orchestrate several processes including making inferences, using prior knowledge to elaborate upon what is read, solving problems that may be encountered, and monitoring comprehension (Schellings, Aarnoutse, & van Leeuwe, 2006).

According to Kintsch’s (1998) construction-integration model, comprehension occurs as readers move about cyclical phases involving construction and integration processes, which correspond with varying levels of comprehension. The simplest level of comprehension occurs at a propositional textbase, or literal, level requiring simple recall of explicit information from the text. A more complex level of comprehension occurs when readers’ construct a situation model of understanding, which involves making inferences by using details from the text and integrating meaning with relevant prior knowledge. The type of inference can vary in difficulty
as well, depending on the amount of cognitive effort required on the part of the reader (Graesser, Louwerse, McNamara, Olney, Cai, & Mitchell, 2007).

**Informational Text Comprehension**

Traditionally, a disproportionate amount of reading instruction during the elementary school years has focused on children’s mastery of fiction story comprehension in comparison to informational texts (Duke, 2000; Duke, 2004; Moss, 2008; Moss & Newton, 2005; Ness, 2011). Recently, however, national concern has grown regarding the importance of teaching children how to comprehend informational texts (CCSS, 2010; International Reading Association, 2000; National Reading Panel, 2000), and literacy experts have heralded the importance of integrating learning to read with reading to learn (CCSS, 2011; International Reading Association/National Council of Teachers of English, 1996; Snow, Burns, & Griffin, 1998; Salinger, Kamil, Kapinus, & Afflerbach, 2005). Concurrently, evidence continues to mount suggesting that children have more trouble tackling expository texts in comparison to narrative reading selections, and that these issues remain, and for some students become more problematic as students move beyond elementary school.

**Barriers to Informational Text Comprehension**

Students encounter various difficulties with informational text comprehension (Baker & Brown, 1984; Mason et al., 2006). Difficulties with informational text comprehension frequently begin in elementary school (Duke, 2004, 2000; Saenz & Fuschs, 2002). They are often more pronounced for struggling readers, including those with and without learning disabilities, than among proficient readers (Mason et al., 2006; Mason, Snyder, Sukhram, & Kedem, 2006). Several factors contribute to the challenges that many students face when reading informational texts. These variables include (1) less experience with expository texts; (2) complex text features
and structures; (3) limited prior knowledge; (4) difficult vocabulary; (5) deficits in fluency and automaticity; (6) lack of comprehension strategies; (7) paucity of direct instruction; and (8) insufficient metacognition.

One barrier to expository text comprehension among students is that they have simply had less early exposure to these types of texts (Caswell & Duke, 1998; Duke, 2004; Durkin, 1979, 1978; Hall, Markham, & Culatta, 2005; Moss, 2008; Ness, 2011). Another challenge for many students reading informational texts is the presence of more complex text features in comparison to narrative texts. Informational texts tend to include technical vocabulary, abstract concepts, dense information, complex and varied text structures, and implicit conceptual relationships (Armbuster, 1984; Dole, Duffy, Roehler, & Pearson, 1991; Fang, 2008; Stein & Traasso, 1981). These complex features exasperate comprehension problems that students often encounter when attempting to process informational texts. Additionally, a lack of prior knowledge of topics addressed in expository texts can impede comprehension (Chall & Jacobs, 2003; Dole, Duffy, Roehler, & Pearson, 1991). Informational texts are also typically laden with challenging vocabulary that is more abstract and specialized, and students who have less exposure to such language may have trouble with comprehension (Chall, Jacobs, & Baldwin, 1990). Students who struggle with comprehending expository text often have difficulty:

- Relating new information to prior knowledge (Johnson, Graham, & Harris, 1997)
- Actively monitoring comprehension (Wong, 1994)
- Understanding text patterns and using text structure knowledge to foster encoding and retrieval (Englert & Thomas, 1987)
Comprehension Strategy Instruction to Improve Text Comprehension

Skilled readers use cognitive, metacognitive, and self-regulatory processes before, during, and after reading that facilitate active construction of meaning leading to solid text comprehension (Almasi & Fullerton, 2012; Ganske & Fisher, 2010; Kamil et al., 2008; Pressley & Afflerbach, 1995; Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998a; Woolley, 2011b) (Israel, 2007; Pressley, El Dinary, Wharton-McDonald, & R. Brown, 1998). Cognitive processes are concrete strategies that readers use to help make sense of text, as well as to learn and remember information read. Metacognitive processes are executive functions that enable readers to make strategic decisions about progress toward a designated goal. Self-regulatory processes, informed and guided by metacognition, refer to self-generated thoughts and actions that readers plan and cyclically adjust to meet learning goals (Zimmerman, 2000).

A multitude of essential comprehension strategies have been identified across numerous studies (National Reading Panel, 2000; Pressley, Wharton-McDonald, Mistretta-Hampston, & Echevarria, 1998b; Pressley, 2000; Pressley, Graham, & Harris, 2006b; Snow, 2002). Strategies such as previewing, activating prior knowledge, predicting text content, setting a purpose and goal for reading, and analyzing text features are often helpful as before reading strategies. Useful during reading strategies include monitoring and clarifying, using fix-up strategies, making connections, generating and answering questions, making inferences, visualizing, identifying main ideas, and summarizing important information. After reading strategies that are helpful include evaluating the text in relation to goals, summarizing, self-questioning, and reflecting on the use and effects of reading strategies. Despite years of research describing the characteristics of proficient readers and the benefits of teaching cognitive, metacognitive, and
self-regulatory processes, comprehension strategy instruction remains uncommon in many elementary schools (Block et al., 2009; Pressley & Allington, 2015a; Pressley, 2000).

**Instructional Interventions in Reading**

Instructional intervention studies contribute to theories of learning and practice. Teachers can support children's development of self-regulation through strategy instruction designed within a metacognitive framework that incorporates essential elements of strategies instruction based on the extant literature. In a recent meta-analysis, Donker and colleagues aggregated data from 58 studies, including 95 strategy interventions among primary and secondary grades to determine the effectiveness of learning strategy instruction upon academic performance (Donker et al., 2014). They considered the impact of researcher-developed measures in comparison with standardized tests to evaluate student performance finding that those designed by researchers appear to inflate effect sizes. Donker et al., 2014 analyzed the effects of significant learning strategies simultaneously with measurement instrument as the covariate. Together, the significant strategies accounted for 36.1% of the variance in effect size. Following simultaneous regression analysis, the researchers used regression with backwards elimination to validate findings. Their final model generally matched findings in previous analyses – general metacognitive knowledge and task value were significant, while planning was not. Next, they examined effects among different subject domains hypothesizing that they could differ in terms of the effectiveness of strategies used. They note that the most frequently addressed strategies included metacognitive approaches with a focus on planning and monitoring.

Among cognitive strategies, elaboration was the most frequently trained sub-strategy. Management strategies were addressed less, and motivational aspects were attended to least. Metacognitive knowledge was explicitly addressed in roughly half of the trainings and dealt
mostly with the "when" and "why" of using learning strategies. In some cases, studies concentrating on metacognitive knowledge were specifically tailored to individual students.

Of the 58 studies included in (Donker et al., 2014) meta-analysis, 15 focused on comprehensive reading. Twelve of those included students in grades 3-5 which are summarized in Table 5. In reading, an overall weighted effect size of .36 was found. General metacognitive knowledge was the only sub-strategy that significantly improved student performance \((n = 8, \beta = .27)\). The sub-strategies elaboration and management of peers yielded lower levels of effectiveness \((n = 19, \beta = -.48; n = 6, \beta = -.27\), respectively). Positive, yet nonsignificant, effects were found for planning \((n = 14, \beta = .15)\), effort management \((n = 3, \beta = .07)\), rehearsal \((n = 2, \beta = .08)\), environmental management \((n = 3, \beta = .04)\), and self-efficacy \((n = 3, \beta = .10)\).

Nonsignificant, yet negative effects, were found among organization, monitoring, evaluation, and personal metacognitive knowledge. Performance most always improved with a combination of learning strategies, supporting a multi-strategy approach when teaching learning strategies.

Learning strategy interventions were highly effective for all types of students; no significant between-group differences were noted. There was no relationship found between the effects of interventions on student performance and students’ age (i.e., grade level) suggesting that learning strategy instruction is as effective for elementary school students as it is for older students (i.e., Grades 6-12). Furthermore, no differential effects were shown for students of different ability levels.

Aggregated across subject areas, effects were higher for self-developed tests compared with intervention-independent tests (Hedges’ \(g = .78\) and \(.45\), respectively). Use of intervention-independent outcome measures were common among studies focused on reading; 70 percent of studies within reading used a standardized test to measure student performance. Only in reading
did the use of intervention-independent tests result in a significantly lower effect than self-developed tests (Hedges’ $g = .82$ and $.22$, respectively).
Table 5

Characteristics of Reading Studies in Elementary School Settings Reported in Donker et al.’s (2014) Meta-Analysis

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>$N$</th>
<th>Grade</th>
<th>Students</th>
<th>Learning strategies</th>
<th>Instrument $^2$</th>
<th>Effect size $^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen and Hancock (2008)</td>
<td>113</td>
<td>5</td>
<td>Low SES</td>
<td>MK (general); CMS (planning, monitoring, control); MMS (none)</td>
<td>Self (1) Indep (1)</td>
<td>0.64 0.15</td>
</tr>
<tr>
<td>(Boulware-Gooden, Carreker, Thornhill, &amp; Joshi, 2007)</td>
<td>112</td>
<td>3</td>
<td>Regular</td>
<td>MK (none); CMS (planning, control); MMS (none)</td>
<td>Indep (2)</td>
<td>0.50</td>
</tr>
<tr>
<td>Bruce and Robinson (2001)</td>
<td>46</td>
<td>5, 5</td>
<td>Special needs</td>
<td>MK (none); CMS (planning, monitoring, rehearsal elaboration); MMS (self-efficacy)</td>
<td>Indep (2)</td>
<td>0.37</td>
</tr>
<tr>
<td>Guterman (2003)</td>
<td>109</td>
<td>4</td>
<td>Low SES</td>
<td>MK (none); CMS (planning, monitoring, control, elaboration); MMS (effort)</td>
<td>Self (1)</td>
<td>0.83</td>
</tr>
<tr>
<td>Huff and Nietfeld, 2009</td>
<td>73</td>
<td>5</td>
<td>Regular</td>
<td>MK (general); CMS (monitoring, elaboration); MMS (none)</td>
<td>Indep (1)</td>
<td>0.00</td>
</tr>
<tr>
<td>Kaniel, Licht, and Peled (2000)</td>
<td>79</td>
<td>5</td>
<td>Gifted</td>
<td>MK (none) CMS (monitoring, control, elaboration) MMS (resources)</td>
<td>Indep (1)</td>
<td>0.66</td>
</tr>
<tr>
<td>Lubliner and Smetana (2005)</td>
<td>77</td>
<td>5</td>
<td>Low SES</td>
<td>MK (general) CMS (monitoring, control, elaboration) MMS (Peers)</td>
<td>Self (2)</td>
<td>0.60</td>
</tr>
</tbody>
</table>

Note. $^1$MK = Metacognitive Knowledge; CMS = Cognitive and Metacognitive Strategies; MMS = Motivation and Management Strategies; $^2$Self = Researcher created test; Indep = Intervention-independent test; $^3$Hedges’ $g$

(continues)
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>N</th>
<th>Grade</th>
<th>Student characteristics</th>
<th>Learning Strategies(^1)</th>
<th>Test Type(^2) ((n) tests)</th>
<th>Effect size(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason (2004)</td>
<td>32</td>
<td>5</td>
<td>Special needs</td>
<td>MK (general); CMS (planning, monitoring, control, elaboration, organization); MMS (none)</td>
<td>Self (8)</td>
<td>0.94</td>
</tr>
<tr>
<td>Souvignier and Mokhlesgerami (2006)</td>
<td>65</td>
<td>5</td>
<td>Regular</td>
<td>MK (none); CMS (planning, monitoring, control, elaboration, organization); MMS (self-efficacy, effort)</td>
<td>Indep (1)</td>
<td>0.14</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td></td>
<td></td>
<td>MK (none); CMS (planning, monitoring, control, elaboration, organization); MMS (none)</td>
<td>Indep (1)</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td></td>
<td></td>
<td>MK (none); CMS (monitoring, elaboration, organization); MMS (none)</td>
<td>Indep (1)</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td></td>
<td></td>
<td>MK (none); CMS (planning, monitoring, control, elaboration, organization); MMS (self-efficacy, effort)</td>
<td>Indep (1)</td>
<td>0.49</td>
</tr>
<tr>
<td></td>
<td>198</td>
<td></td>
<td></td>
<td>MK (none); CMS (planning, monitoring, control, elaboration, organization)</td>
<td>Indep (1)</td>
<td>0.57</td>
</tr>
<tr>
<td>Van Keer and Vanderlinde (2010)</td>
<td>59</td>
<td>3</td>
<td>Regular</td>
<td>MK (none); CMS (monitoring, elaboration, organization); MMS (peers)</td>
<td>Indep (1)</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td>MK (none); CMS (monitoring, elaboration, organization); MMS (peers)</td>
<td>Indep (1)</td>
<td>0.03</td>
</tr>
<tr>
<td>Vaughn, Klingner, and Swanson (2011)</td>
<td>59</td>
<td>7, 5</td>
<td>Regular</td>
<td>MK (personal); CMS (planning, monitoring, control, elaboration); MMS (peers)</td>
<td>Indep (3)</td>
<td>-0.01</td>
</tr>
<tr>
<td>Wright and Jacobs (2003)</td>
<td>59</td>
<td>3, 5</td>
<td>Special needs</td>
<td>MK (personal); CMS (planning, monitoring); MMS (none)</td>
<td>Indep (3)</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Note. \(^1\)MK = Metacognitive Knowledge; CMS = Cognitive and Metacognitive Strategies; MMS = Motivation and Management Strategies; \(^2\)Self = Researcher created test; Indep = Intervention-independent test; \(^3\)Hedges’ \(g\)
Reciprocal Teaching

Reciprocal teaching ([RT]; Palincsar & Brown, 1984) is an instructional method designed to improve students’ reading comprehension through guided practice in applying concrete cognitive strategies. Students learn and practice four comprehension strategies: (1) predicting, (2) clarifying, (3) questioning, and (4) summarizing. In RT, teachers model the strategies and guide group discussions about their applications. Students assume the role of teacher after acquiring skill with the four comprehension strategies, and working in small groups, they alternate between taking on the role of teacher and leading discussions about given texts and students actively participating in the discussions. For example, after modeling each strategy and providing guided practice, teachers might assign students to groups of four and provide an RT discussion guide such as that shown in Figure 6 which was used in the treatment classes.
Reciprocal Teaching Cue Card

**Questioning**
- Ask sentences that begin with who, what, where, when, why or how
- Ask main idea questions first.
- Ask questions with answers from different places
  - In The Book, Right There & Think and Search
  - In My Head: Author and Me & On My Own

**Clarifying**
- Look for words and phrases that are not clear.
- Ask others if they have words, phrases or ideas to be clarified.
- When clarifying words, phrases or ideas, try one of these strategies.
  - Read all around it.
  - Study the structure.
  - Search your schema.
  - Make a substitution.

**Summarizing**
- Include the main idea, not the details.
- Keep it short... keep it simple.
- Use 10 keywords from the selection to state your summary.

**Predicting**
- Explain what you think will happen next.
- Use clues from the book to support your prediction.
- Say “I think ______ will happen because ______.” OR
  “I think I will learn ______ because ______.”

*Figure 6. Reciprocal teaching cue card used in the intervention classrooms*
Collaborative Strategic Reading

Collaborative Strategic Reading ([CSR]; Klingner, Vaughn, & Schumm, 1998) is an instructional program that has successfully increased fourth (Klingner et al., 1998) and fifth grade (McCown & Thomason, 2014) students’ informational text comprehension. Based largely on social cognitive learning theory, CSR combines elements from two previously validated instructional approaches for improving children’s learning: cognitive strategy instruction and cooperative learning (Klingner et al., 1998; Vaughn & Janette, 1999).

The CSR instructional plan combines four cognitive and metacognitive reading strategies to facilitate students’ informational text comprehension (Klingner et al., 1998). The four strategies include: (1) Preview (e.g., before reading, use text features to predict content and activate prior knowledge); (2) Click and Clunk (e.g., during reading, monitoring comprehension to identify challenging words and concepts and use fix-up strategies when difficulties arise); (3) Get the Gist (e.g., during reading, restating the most important ideas for each paragraph); and (4) Wrap Up (e.g., after reading, to summarize the important ideas and to generate questions that a teacher might ask on a test).

In a more recent investigation McCown and Thomason (2014) examined the impact of CSR on both informational text comprehension and metacognitive awareness among fifth grade students. Children who received CSR instruction outperformed those in control groups on informational text comprehension but did not show differential gains in metacognitive awareness as measured by a single self-report survey. Despite a primary research purpose of examining the effect of CSR on metacognitive awareness, adjustments were not made to the traditional CSR instructional approach to explicitly improve children’s metacognitive awareness. Furthermore,
the use of a single self-report questionnaire to measure metacognitive awareness could have artificially masked the program’s impact on participants’ metacognition.

**Concept Oriented Reading Instruction**

The primary goal of Concept Oriented Reading Instruction (Guthrie et al., 1998; Guthrie, Wigfield, Metsala, & Cox, 1999; Guthrie et al., 2007) is to increase students’ reading comprehension by enhancing reading engagement. In CORI classrooms, reading comprehension instruction is integrated with science (Guthrie, Klauda, & Ho, 2013). There are seven core principles of CORI. These include: (a) conceptual theme; (b) real-world interaction; (c) self-direction; (d) collaboration; (e) strategy instruction; (f) self-expression; and (g) coherence.

Guthrie and colleagues (1998) explored strategy use and text comprehension for students in grades 3 and 5 who received integrated instruction using CORI and similar students who received traditional instruction that targeted the same learning objectives over the course of one school year. Findings showed that the CORI program had a positive effect on strategy use and comprehension beyond prior achievement and prior knowledge.
Transactional Strategies Instruction

Transactional Strategies Instruction (Pressley & Beard-Dinary, 1992) promotes learning how to properly choose, orchestrate, and apply cognitive strategies throughout content areas and across different texts. Three key principles of TSI include: (a) readers construct meaning through connecting text with prior knowledge; (b) meaning construction occurs through transactions between peers; and (c) students’ responses and interpretations throughout conversations about the text guide teachers’ instruction (Brown, Pressley, Van Meter, & Schuder, 1996a; Pressley et al., 1992; Pressley & Allington, 2015a). Within the TSI model, strategy instruction occurs all year long. Students Achieving Independent Learning (SAIL) was developed as a prototype of TSI to address the needs of at-risk students and has shown success in improving comprehension among young students (Brown, Pressley, Van Meter, & Schuder, 1996b; Dole, Nokes, & Drits, 2009).

Using a Metacognitive Framework for Reading Instruction

In 1979, John Flavell stated, “I think that increasing the quantity and quality of children’s metacognitive knowledge and monitoring skills through systematic training may be feasible as well as desirable” (p. 10). Ten years later, he wrote, “School and other life experiences do not advance the child’s metacognitive development as fast or as far as might be desirable, and there is a growing feeling that we should try to find ways to teach it more directly and systematically (Flavell, 1989, p. 263). Since then, studies investigating the effects of systematic instruction in metacognition on various student outcomes and across different domains have proliferated (Brown & Palincsar, 1982; Paris & Winograd, 1990; Pressley & Ghatala, 1990). Converging evidence suggests that metacognition is related to increased learning, improved performance, and greater achievement of educational goals (Stolp & Zabrucky, 2009, p. 8). Additionally,
instruction addressing specific metacognitive reading strategies to enhance comprehension is effective for struggling readers (Block et al., 2009; Clarke, Snowling, Truelove, & Hulme, 2010; Donker et al., 2014; Lanning, 2009; Mason, Snyder, Sukhram, & Kedem, 2006; Palincsar & Brown, 1984; Solis et al., 2012; Wong & Jones, 1982; Woolley, 2011a).

Metacognitive reading strategies enable readers to adjust reading behaviors before, during, and after reading (Woolley, 2011a). These strategies can include self-monitoring, self-questioning, self-assessment, and self-reflection. Teaching children how to use metacognitive reading strategies is linked to increased cognitive engagement. Increased cognitive engagement not only initiates and sustains goal-directed reading behaviors, but it also encourages active construction of meaning while reading.

Designing Classroom Contexts to Support Metacognitive Growth

As Duke and Pearson (2002) succinctly state, “It is not enough just to offer good instruction. Several important features of good reading instruction also need to be present. Otherwise, the comprehension instruction will not take hold and flourish” (p. 108). Their model of comprehension instruction connects and integrates comprehension strategy instruction and opportunities to read, write, and discuss texts (Duke & Pearson, 2008). It consists of five components: (1) clear explanation of the strategy including when and how it should be used; (2) teacher and/or student modeling of the strategy; (3) collaborative use of the strategy; (4) guided practice with gradual release of responsibility; and (5) independent practice using the strategy. Orchestrating multiple comprehension strategies throughout these five phases is an important aspect of Duke and Pearson’s (2002) model of comprehension instruction.
**Metacognitive Monitoring as a Foundational Comprehension Strategy**

Table 6

*Monitoring Applied to Other Comprehension Strategies*

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Examples of Monitoring Application</th>
</tr>
</thead>
</table>
| Making connections     | Linking background knowledge and experiences with ideas in the text        | • Relate to prior knowledge and personal experiences  
|                        |                                                                            | • Connect ideas across texts  
|                        |                                                                            | • Link text to worldwide events                                                                     |
| Predicting             | Using clues in the text and world knowledge to make an informed guess about what will come next in the reading | • Confirm predictions while reading  
|                        |                                                                            | • Modify predictions based on new information                                                        |
| Recognizing Text Structure | Identifying how a text is organized                                     | • Identify structural elements in the text  
|                        |                                                                            | • Identify main ideas to solve confusion related to text structure  
|                        |                                                                            | • Use a graphic organizer to track text structure during reading  
|                        |                                                                            | • Find signal words to identify text structures after each section  
|                        |                                                                            | • Reread text to seek clarification when information seems inconsistent with the expected text structure |
| Asking Questions       | Self-questioning during reading                                          | • Articulate new questions while reading when new or confusing information is encountered in the text  
|                        |                                                                            | • Answer questions and provide supporting evidence from the text  
|                        |                                                                            | • QAR (Question – Answer - Relationships)                                                           |
| Answering Questions    | Responding to peer- or teacher-directed questions                         | • Generate answers to peer- and teacher-directed questions and support with text evidence          |

*(continues)*
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Examples of Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visualizing</td>
<td>Forming mental pictures during reading</td>
<td>• Confirm whether the text matches their image</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adapt visualizations based on text descriptions</td>
</tr>
<tr>
<td>Summarizing</td>
<td>Restating main ideas and key details in own words</td>
<td>• Evaluate the summary to see if it reflects understanding of the text.</td>
</tr>
<tr>
<td>Inferring</td>
<td>Drawing conclusions about ideas not explicitly stated in the text</td>
<td>• Determine whether conclusions are supported via text evidence</td>
</tr>
<tr>
<td>Clarifying</td>
<td>Recognizing comprehension breakdowns and implementing debugging techniques as needed</td>
<td>• Realization that understanding has halted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Implementing fix-up strategies to repair misunderstandings</td>
</tr>
</tbody>
</table>
Figure 7. Classroom practices to improve comprehension within a triadic model of reading instruction
Table 7
Classroom Contexts to Support Proficient Reading Comprehension

<table>
<thead>
<tr>
<th>Reading and SRL Phases</th>
<th>Strategies</th>
<th>Metacognition</th>
<th>Motivation</th>
</tr>
</thead>
</table>
| **PHASE 1** Before Reading Strategies | • Set reading purpose  
• Activate prior knowledge  
• Preview text  
• Make predictions | • Activate metacognitive knowledge  
• Domain knowledge  
• Tactics and strategies  
• Allocate resources | • Set reading goals  
• Self-efficacy judgments  
• Goal orientation: mastery / performance goals |
| **Anticipatory:** forethought, planning, and activation | | |
| **PHASE 2** During Reading Strategies | • Select and adapt reading strategies  
• Make connections  
• Make / revise predictions  
• Infer  
• Visualize | • Comprehension monitoring and control  
• Adjust tactics and strategies | • Awareness and monitoring of motivation and affect  
• Select and adapt strategies for managing motivation and affect |
| **Enactment:** monitoring and control | | |
| **PHASE 3** After Reading Strategies | • Reflect on performance  
• Summarize  
• Draw conceptual diagram  
• Adapt, change, and fine-tune | • Evaluate comprehension, memory, and learning  
• Decide next steps | • Affective reactions  
• Goal attainment  
• Self-efficacy  
• Attributions  
• Task value |
| **Self-reflection:** evaluation | | |

*Source.* Adapted from Huff & Hoffmann (2009) session presentation at the International Reading Association Annual Meeting, Phoenix, AZ.
Summary and Conclusions

Despite findings linking multiple comprehension strategy instruction that simultaneously support students’ development of metacognition and self-regulation to increased reading achievement, there remain several issues that must be addressed as the field moves forward. First, more work is needed within actual classrooms by current in-service teachers. Additionally, students must learn to actively engage in and learn from complex texts across many domains throughout their educational careers. To facilitate these characteristics, classroom teachers must implement pedagogical strategies that directly target strategic reading. Becoming a strategic reader is an important goal for all students, and teachers can implement instructional routines that support students’ progress toward this goal. Unfortunately, reading comprehension instruction in natural classroom environments often fails to systematically address this goal.
CHAPTER 3: Methods

The North Carolina State University Institutional Review Board approved all procedures for this study. The school district and building administrator also approved all procedures for this study. The district approval letter is provided in Appendix A.

Design

A quasi-experimental nonequivalent control group design was used to examine the effects of teaching reading using a metacognitive framework and training of comprehension monitoring on fourth graders’ reading achievement and calibration accuracy compared with students who received regular reading instruction (see Figure 8). Intact classes of students served as either the treatment or control group. Random assignment of students to either condition was unavailable because district policies prohibit interruption of students’ instruction within assigned classrooms; therefore, a quasi-experimental nonequivalent control group design was the best option (Gall, Gall, & Borg, 2007).

<table>
<thead>
<tr>
<th>Instructional Intervention</th>
<th>Pretests</th>
<th>Intervention</th>
<th>Posttests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>Regular Teaching Strategies</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Figure 8. Quasi-Experimental Design with a Nonequivalent Control Group*
Data collected from existing school and classroom records addressed each research hypothesis, which included:

1. Metacognitive monitoring instruction will significantly increase reading achievement in fourth grade students.
   
   $H_{1a}$: While growth in reading achievement is expected across both groups, it is hypothesized that students who receive reading instruction using a metacognitive framework will show larger gains in reading achievement compared with those receiving standard reading instruction.
   
   $H_{1b}$: Based on previous findings that struggling readers especially benefit from interventions using metacognitive strategies, it is further hypothesized that achievement gains among struggling readers in the metacognitive group will be significantly greater compared with other participants.

2. Metacognitive monitoring instruction including training in the use of confidence estimates will increase fourth grade students' calibration accuracy as compared to students who do not receive monitoring instruction.
   
   $H_{2a}$: Based upon prior evidence, it is hypothesized that reading proficiency level (struggling versus non-struggling) will moderate the relationship between instruction in the use of confidence estimates and calibration accuracy.
Participants

Participants included 63 fourth grade students (70% White, 18% Hispanic, 10% African American, 1% Multi-Racial and 1% American Indian) from four intact classrooms in one Title I elementary school located in a rural southeastern school district. The school served 387 students in Grades K-5 during the 2014-15 school year. At the time of this study, the school district included nine elementary schools, four middle schools, and five high schools, and all but four of the 18 schools received federal Title I funds indicating that a large proportion of students throughout the district were identified as socioeconomically disadvantaged.

Students in the sample were assigned to one of four homerooms within the school. Pairs of homeroom classes were taught by teams of two teachers with one instructor teaching Mathematics and Science and the other teaching English Language Arts (ELA) and Social Studies. Students were assigned to a 4th Grade homeroom based primarily on their 3rd grade reading achievement level. Table 8 presents an overview of student demographics and prior year reading achievement for each participating class.
Table 8

Student Demographics and Prior Year (Grade 3) North Carolina READY Reading End-of-Grade

Test Results by Fourth Grade Class (percentage)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention</th>
<th></th>
<th>Comparison</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1&lt;sup&gt;1&lt;/sup&gt;</td>
<td>A2&lt;sup&gt;1&lt;/sup&gt;</td>
<td>B1&lt;sup&gt;2&lt;/sup&gt;</td>
<td>B2&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>N</td>
<td>13</td>
<td>20</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8 (.62)</td>
<td>8 (.40)</td>
<td>5 (.42)</td>
<td>6 (.33)</td>
</tr>
<tr>
<td>Female</td>
<td>5 (.38)</td>
<td>12 (.60)</td>
<td>7 (.58)</td>
<td>12 (.67)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 (.05)</td>
</tr>
<tr>
<td>Black</td>
<td>2 (.15)</td>
<td>1 (.05)</td>
<td>3 (.25)</td>
<td>-</td>
</tr>
<tr>
<td>Hispanic</td>
<td>6 (.46)</td>
<td>-</td>
<td>2 (.17)</td>
<td>3 (.17)</td>
</tr>
<tr>
<td>Multi-racial</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 (.05)</td>
</tr>
<tr>
<td>White</td>
<td>5 (.39)</td>
<td>19 (.95)</td>
<td>7 (.58)</td>
<td>13 (.70)</td>
</tr>
<tr>
<td>Support Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic-Intellectually Gifted</td>
<td>-</td>
<td>8 (.40)</td>
<td>-</td>
<td>6 (.33)</td>
</tr>
<tr>
<td>Students with Disabilities</td>
<td>2 (.15)</td>
<td>-</td>
<td>1 (.08)</td>
<td>-</td>
</tr>
<tr>
<td>English as a Second Language</td>
<td>6 (.46)</td>
<td>-</td>
<td>2 (.17)</td>
<td>-</td>
</tr>
<tr>
<td>Speech</td>
<td>2 (.15)</td>
<td>1 (.05)</td>
<td>2 (.17)</td>
<td>-</td>
</tr>
<tr>
<td>NC Reading EOG Achievement Levels&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>9 (.69)</td>
<td>1 (.05)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Level 2</td>
<td>4 (.31)</td>
<td>-</td>
<td>1 (.08)</td>
<td>-</td>
</tr>
<tr>
<td>Level 3</td>
<td>-</td>
<td>1 (.05)</td>
<td>4 (.33)</td>
<td>4 (.22)</td>
</tr>
<tr>
<td>Level 4</td>
<td>-</td>
<td>13 (.65)</td>
<td>7 (.58)</td>
<td>10 (.56)</td>
</tr>
<tr>
<td>Level 5</td>
<td>-</td>
<td>5 (.25)</td>
<td>-</td>
<td>4 (.22)</td>
</tr>
</tbody>
</table>

Note. <sup>1</sup>A1 and A2 = taught by Teacher A; <sup>2</sup>B1 and B2 = taught by Teacher B; <sup>3</sup>NC Reading EOG Scores are from students’ 3<sup>rd</sup> Grade Year (May 2014)
The principal investigator provided instruction for classes that formed the intervention group (i.e., classes A1 and A2 displayed in Table 8). Class A1 was a 3-4 transition class\(^2\) comprised of 13 students who began fourth grade in August 2014 as struggling readers. None of these children attained proficiency on the 3rd Grade Reading EOG Test, which was administered at the end of their 3rd grade school year in May 2014. Six students qualified for at least one good cause exemption\(^3\) pursuant to NC RtA legislation and were, therefore, promoted to Grade 4. The remaining seven students were placed into the class as transition students (i.e., they were labeled retained 3rd grade reading in school records).

Class A2 was a regular fourth grade classroom with 20 students. Nineteen students in this group scored at or above proficient (i.e., Level 3 or above) on the 3rd Grade Reading EOG Test. One child scored a Level 1 on this test, but subsequently demonstrated reading proficiency on the Read to Achieve Test\(^4\) administered in June 2014. This student received Academically-Intellectually Gifted (AIG) services for math and was therefore not placed into the 3-4 transition class. Eight students in Class A2 were identified as Academically-Intellectually Gifted (AIG) in reading.

A second fourth grade ELA teacher taught the two classes that formed the comparison group (i.e., Class B1 and Class B2 in Table 8). Class B1 included 12 students considered low-to-

\(^2\) Transitional classrooms are designed to meet 4th grade performance standards while remediating areas of reading deficits (North Carolina Read to Achieve Program, S.L. 2012-142).

\(^3\) Students are exempt from mandatory retention in 3rd grade for good cause which includes students who are: 1) Limited English Proficient with less than two years of English as a Second Language instruction; 2) identified with disability with an Individualized Education Plan that specifies the use of alternative assessments and reading interventions; 3) provided with reading intervention and have more than one previous retention; and 4) demonstrated reading proficiency appropriate for third graders through an alternative assessment method (S.L. 2012-142).

\(^4\) Students may take the Read to Achieve Test if they do not pass the standard administration of the North Carolina READY Grade 3 End-of-Grade Test.
average in reading proficiency based on prior-year achievement. Eleven students scored at or above proficient (i.e., Level 3 or above) on the 3rd Grade Reading EOG Test. One student demonstrated 3rd grade reading proficiency by achieving a Text Reading Comprehension (TRC) score of Level P prior to the end of the 3rd grade school year. Therefore, this student met good cause pursuant to NC RtA legislation and was promoted to 4th grade.

Class B2 consisted of 18 students considered average-to-high in reading proficiency. All students in this class passed the 3rd Grade Reading EOG Test administered in May 2014. Six students received AIG services for reading.

**Measures**

Data for this study was gathered from existing school and classroom records during the 2014-15 school year. Scores from standardized assessments were used to measure students’ reading achievement and growth. Using standardized tests to measure achievement and academic growth offer several advantages (Nunnally & Bernstein, 1994):

- Objectivity
- Quantification
- Communication
- Economical
- Generalizable
- Evaluation of progress over time and learning of common outcomes
- High technical quality and comprehensive manuals
- Standardized directions and scoring
- Equivalent forms
• Norms based on large samples that provide a standard frame of reference

For all participants, current year (Grade 4) Reading EOG Test scores was the primary measure of reading achievement (i.e., the dependent variable). Comprehension monitoring was assessed using two measures of calibration: calibration accuracy and calibration bias. Scores for these measures were calculated using confidence judgments provided by all participants for each comprehension question on three classroom-based tests that were part of a unit on informational text structures. Table 9 summarizes the characteristics for each outcome measure used to address the primary research hypotheses. Specific details and characteristics about the dependent variables are provided in the next section.
Table 9

Research Hypotheses and Characteristics of Associated Measures

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Dependent Variable(s)</th>
<th>Measure(s)</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metacognitive monitoring instruction will increase reading achievement among fourth grade students compared to students who do not receive monitoring instruction.</td>
<td>Current Year Reading Achievement</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; Grade Reading EOG Scores</td>
<td>α = .88-.92</td>
</tr>
<tr>
<td></td>
<td>Achievement Growth</td>
<td>Difference between 3rd and 4th Grade Reading EOG Scale Scores</td>
<td></td>
</tr>
<tr>
<td>Metacognitive monitoring instruction that includes training in the use of confidence judgments will increase fourth grade students' calibration accuracy as compared to students who do not receive metacognitive monitoring instruction that includes training in the use of confidence judgments.</td>
<td>Confidence Pretest</td>
<td>Derived scores from item-level confidence estimates provided by students on the Text Structures Pretest and Text Structures Summative Unit Tests</td>
<td>α = .55</td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td>Confidence Judgments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calibration Accuracy</td>
<td>Confidence Judgments</td>
<td>α = .43</td>
</tr>
<tr>
<td></td>
<td>Pretest</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calibration Bias</td>
<td>Confidence Judgments</td>
<td>α = .45</td>
</tr>
<tr>
<td></td>
<td>Pretest</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posttest</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Reading Achievement**

*North Carolina READY End-of-Grade English Language Arts Test, Grades 3 and 4,*

*Edition 4*

This standardized test measures students’ proficiency of the Common Core State Reading Standards. The assessment presents reading passages from published literature and informational texts, and students answer multiple choice comprehension questions about each passage. Participants took the 3rd Grade Reading EOG Test in May 2014 and the 4th Grade Reading EOG Test in May 2015.

The 3rd Grade Reading EOG test included 44 items and the 4th Grade test had 52 items. Reliability estimates across three test forms at each grade level established during the norming year (2012-13) ranged from 0.88 to 0.92. Item difficulty was also established during the norming year. Following item response theory ([IRT], Nunnally & Bernstein, 1994), the average proportion correct, or *p*-value, was used as a measure of item difficulty. Item difficulties across the three test forms ranged from 0.71 (Grade 4) to 0.74 (Grade 3). The average difficulty of the tests increases at successively higher grade levels (i.e., the *p*-values decrease).

**Comprehension Monitoring**

Comprehension monitoring was measured via local confidence judgments students recorded on a 100-mm line that followed each test item (Schiffman, Reynolds, & Young, 1981). The left end of the line corresponds to no confidence and was labeled 0% *Sure*, and the right end of the line reflects total confidence and was labeled 100% *Sure*. Students drew a slash through the portion of the line that best represented their perceived confidence in their selected answer on the preceding question. The slash indicates how much confidence students have in their answers to reading comprehension test items. Standardized directions for marking confidence judgments
were written at the top of each test and were provided for all participants. These were read aloud to all classes by their respective teacher. The directions were: *After each item, make a slash mark on the line (or either end) to show how sure you are that the answer you circled is correct.*

Following each test item, the question *How sure are you that the answer you circled for the above item is correct?* and the 100-mm line was presented. Just before students began the text structures unit pretest, the teachers displayed a one-page guide shown in Figure 9 to explain how to mark confidence judgments. After explaining how to mark confidence judgments using the guide, the teachers removed it. Students did not have access to the confidence judgment guide while taking the pretest. Students provided confidence judgments for each item across three multiple-choice comprehension tests that were used during the informational text structures unit. Additional details about calibration indices are described in the next section.
Figure 9. Guide for making confidence judgments

**Calibration Indices**

Calibration accuracy is calculated by determining the absolute value of the difference between the student’s confidence judgment (i.e., the measured location of marks on the 100-mm lines) and performance for each test item (i.e., dichotomized as 0 or 1, where 0 is an incorrect answer), summed over all items on the test and divided by the total number of test items (Keren, 1991; Yates, 1990). Calibration accuracy scores can range from zero (perfect calibration) to one (complete lack of calibration). For example, if a confidence judgment for a given item is 89 and
the student answered the question correctly the accuracy score for that item would be .11
(absolute value of 1 - .89). An accuracy score of .11 indicates high accuracy (i.e., it is close to 0).

*Calibration bias* is the signed difference between average confidence and average
performance scores on each test (Keren, 1991; Yates, 1990). Calibration bias scores can range
from -1 to 1. A score of zero indicates perfect calibration. Positive bias scores indicate
overconfidence and negative bias scores indicate under-confidence. The farther the score is from
zero the more biased it is. For example, if a student has an average confidence score of 76 for a
given test and answered 89% of the questions correctly their bias score would be -.13 (.76 – .89),
which would indicate slight under-confidence.

**Procedures**

The teacher-researcher provided instruction in the two intervention classes, while another
teacher taught the two comparison classes. Students in both groups were taught the same
Common Core State Reading Standards at or nearly at the same time (see Table 10), and
instruction was provided by both teachers using state, district, and school provided materials,
various trade books, and activities from other resources (e.g., instructional websites). The
teachers engaged in collaborative lesson planning and used common summative reading
assessments for the entire grade level. Although these and other similarities are notable, the
overall approaches to reading instruction differed. Characteristics of the reading instruction
provided to each group are described in the next two sections.
### Table 10

**English Language Arts Common Core State Standards Previously Addressed**

<table>
<thead>
<tr>
<th>Common Core State Reading Standard</th>
<th>Unit(s)</th>
<th>Quarter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.</td>
<td>1</td>
<td>All</td>
</tr>
<tr>
<td>RI.4.2 Determine the main idea of a text and explain how it is supported by key details; summarize the text.</td>
<td>2</td>
<td>Q1, Q2</td>
</tr>
<tr>
<td>RI.4.4 Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade 4 topic or subject area.</td>
<td>2</td>
<td>All</td>
</tr>
<tr>
<td>RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.</td>
<td>3</td>
<td>Q3</td>
</tr>
<tr>
<td>RI.4.5 Describe the overall text structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.</td>
<td>3</td>
<td>Q3, Q4</td>
</tr>
<tr>
<td>RI.4.6 Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.</td>
<td>3</td>
<td>Q2, Q3</td>
</tr>
<tr>
<td>RI.4.8 Explain how an author uses reasons and evidence to support particular points in a text.</td>
<td>3</td>
<td>Q3</td>
</tr>
<tr>
<td>RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the topic knowledgeably.</td>
<td>3</td>
<td>Q3</td>
</tr>
<tr>
<td>RI.4.10 By the end of the year, read and comprehend informational texts including history/social studies, science, and technical texts, in the grades 4-5 text complexity band, proficiently, with scaffolding as needed at the high end of the range.</td>
<td>4</td>
<td>All</td>
</tr>
</tbody>
</table>

L.4.4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies. 1, 2, 3 All

*Note. RI = Reading Informational Text, L = Language, Q = Quarter; Q1 = first nine-weeks, Q2 = second nine-weeks; Q3 = third nine-weeks; Q4 = fourth nine weeks*
Reading Instruction in the Treatment Group

Comprehension monitoring was the foundational reading strategy in the treatment group. A significant amount of time was devoted to developing students’ declarative, procedural, and conditional knowledge related to comprehension monitoring and in guiding them to understand its critical role among other comprehension strategies (e.g., identifying main ideas, summarizing, inferring, visualizing, determining text structure, etc.).

Early Monitoring Lessons

Students first learned how monitor their comprehension by dividing texts into smaller chunks, pausing after each chunk of text, and asking, “Do I understand what this part of the text is mostly about”? Students read small portions of a given text and were asked to determine the extent to which they understood a text chunk by writing out the gist, or main idea, in the margin for each section. When students had trouble determining main ideas, they were guided in the selection and use of an appropriate fix-up strategy to clarify comprehension (e.g., selective rereading, visualizing, searching for important words, and locating key details). Work samples from one of these early lessons, shown in Figure 12, illustrate students’ interaction with passages through text work. Additional samples are provided in Appendix C.

Instruction of Additional Comprehension Strategies

Once students had mastered the main idea strategy, they were taught how to use main idea statements to produce brief summaries of given texts. Summarizing became yet another way for students to self-check how well a text had been understood. Instruction in the use of additional comprehension strategies and the role of self-monitoring within each continued throughout the school year. As the school year progressed, children’s interaction with reading
selections through text work increased, and they used a variety of symbols and strategies to work through complex passages. Examples of symbol and strategy cards are provided in Figure 10.

![Symbol and Strategy Cards](image)

**Figure 10.** Text symbols and NAMES strategy cards used in the treatment classrooms

**Before, During, and After Reading Strategies**

The researcher consistently worked with students on linking the use of before, during, and after reading strategies to improved comprehension of any text encountered. This was taught through explicitly pointing out that using strategy $x$ helps increase comprehension because of $y$. Numerous before, during, and after reading comprehension strategies were taught and consistently used throughout the year.

*Before reading strategies* included previewing, predicting, and activating prior knowledge. *During reading strategies* included monitoring comprehension (by pausing after each paragraph or section in a text, and responding in some way to show understanding), annotating texts using various marks and writing notes directly on passages, jotting down main ideas for each paragraph or section in a text, boxing words that have unknown meanings and
trying to figure them out using text-based clues, and chunking unfamiliar words that are difficult to decode. *After reading strategies* included creating graphic organizers to represent the information from the text (these were often used during reading as well), responding to the text by answering multiple-choice and open-ended questions citing text-based evidence to justify answers, writing summaries, and various other response activities to demonstrate understanding. Generally, students in both treatment classes had trouble with consistently applying these strategic processes independently during the first half of the school year.

**Modeling and Think-Aloud**

Teacher modeling of strategic reading processes was a regular daily routine in the intervention classes. Peer modeling of strategic reading processes was provided by student leaders, who volunteered to model reading strategies for the class. During discussions related to either reading strategies or targeted comprehension skills for given lessons, the most common questions posed to students from both the teacher and student leaders were:

- **Why?**
- **How do you know?**
- **What evidence/justification/validity do you have for your idea(s)?**

As part of teacher and peer modeling of comprehension strategies, think-aloud procedures were used during whole- and small-group instruction to explicitly share when, why, and how to use comprehension strategies while reading a section of text. For example, during the first several weeks of the school year, students were learning about the strategy, monitor comprehension. The monitor comprehension strategy was first introduced using a short expository article. The following lesson excerpt demonstrates the teacher’s use of think-aloud processes; it is taken from an introductory comprehension strategy lesson that occurred on
Today, we are going to begin learning about one of the most important reading strategies that good readers use: Monitor Comprehension. Let’s put a cloud or circle around the name of the strategy. It is located at the top right corner of the page.

I drew a cloud around MONITOR COMPREHENSION and students did so as well on their copies.

[Hmmm, what does monitor comprehension mean? Well, I think I know what “monitor” means. I think monitor means to watch over something. This reminds me of the job of a Hall Monitor. Hall Monitors stand in the hallways during arrival and dismissal and watch students to make sure that they walk, stay on the right side, and talk quietly in the hallways. Now for the second term: comprehension. I know that comprehension relates to reading texts...like understanding texts. I have an idea of what the individual words monitor and comprehension mean, but I’m not sure what monitor comprehension really means!]

Let’s look at the information at the top of the passage that says, READ THE PASSAGE. It says, “As you read, pause after each section to think about whether you understood the information.”

[Okay, now I think I get it. Comprehension means understanding something I have read. Since I know that monitor means “to watch over something,” and the directions I just read said to pause during reading and think about whether you have understood the information, I am pretty sure that “monitor comprehension” means that I need to stop at
the end of each section – maybe after each paragraph – and decide whether I understood that part of the passage.]

Before we begin reading, let’s preview the text because we know that good readers take time to preview what they are getting ready to read. Why is this an important reading strategy? (students respond)

[I see that there are two sections in the text each with a bold-faced heading: Introduction and Size and Temperature. I don’t see a title for the whole selection though. That is odd. The first heading is “Introduction.” That must mean that the paragraph in this section will give me an overview of the topic].

Boys and girls let’s go ahead and draw a circle around the heading, Introduction and label it “Heading 1.” We can also go ahead and annotate that heading by writing a phrase to show our thinking about that part of the text. Earlier, you heard me thinking aloud that “Introduction” must mean that the paragraph will likely give an overview of the topic. So, let’s write, “to give an overview” as our annotation for this heading.

[Okay, now I should read the second heading, label it, and give an annotation, too. The heading is, Size and Temperature. So, I am pretty sure this part of the text will give specific details about how big or small, and how hot or cold the area is. That is what I will write for my annotation of the heading, Size and Temperature.]

Alright, now it is time to read the first section of the text. I will read aloud while you follow along on your copy. I will remember to stop after the first section to monitor my comprehension, which means that I will pause and think about whether I understood the information.
[Now that I have read the first section, I understand that the topic of this passage is the Arctic Ocean. I also learned that the Arctic Ocean is the smallest and coldest ocean in the world. I am a little bit confused, though, about the last two sentences that tell about life in the Arctic Ocean. I think that I need to reread those last two sentences again so that I might get a better understanding of what the information means].

Let’s reread those two sentences to see if they will make more sense.

[Ah, now I have a better understanding of this information. The text says that the Arctic Ocean is home to penguins, walruses, polar bears, and whales. Next, it says that since the ocean is so cold, few plants and animals can live there. When I first read these two sentences, they confused me because it seems like there are several animals that call the Arctic Ocean home, but then I read that few plants and animals could live there. Now, after rereading those last two sentences, I am thinking that animals like penguins and polar bears can survive in the cold Arctic area, but the world is full of many other kinds of animals that would not be able to survive such cold temperatures. By rereading the confusing part of that section, I now have a better understanding of the information].
Figure 11. Student Work Sample
Reading Comprehension Instruction in the Comparison Group

Reading instruction provided to all participants shared several similarities and differences. Like students in the intervention group, those in the comparison group received direct instruction about identifying main ideas, summarizing, and other reading skills that are part of the reading curriculum. They also received instruction about using various before, during, and after reading strategies like those taught in the intervention group. For example, like students in the intervention group, those in the comparison group were taught to preview, make predictions, and think about relevant background knowledge prior to reading. Additionally, children in the comparison group were taught to underline main ideas, identify important details, and mark unfamiliar words while reading. This is similar the text work used by students in the treatment group. Students in the comparison group, like those in the intervention group, received instruction about useful fix-up strategies when working with complex texts. Fix-up strategies taught in both groups included:

- rereading
- visualizing
- using context clues to figure out the meanings of unknown words

Although there were several similarities in reading instruction provided to all students in the sample, there were also key distinctions between the two instructional approaches. For example, while students in the comparison group received comprehension strategy instruction, it was not explicitly designed and guided by the theories of metacognition and self-regulation. Students in both groups were required to provide justification for answers to reading comprehension questions by marking relevant sections within passages that supported chosen answers, but those in the comparison group did not encounter the extensive strategy and text
work that were mainstays in the treatment group. Finally, while students in the comparison group made confidence judgments on practice passages and the assessments used in conjunction with the informational text structures unit, they did not receive explicit instruction about using the judgments as a tool for comprehension monitoring.

**Procedures for All Participants**

**Informational Text Structures Unit**

As a professional development activity required by the school, the fourth grade ELA teachers developed a unit about informational text structures. The entire unit is provided in Appendix B. The unit addressed Reading Standard RI.4.5 which requires students to describe the overall structure (i.e., chronology, comparison, cause-effect, and problem-solution) of events, ideas, concepts, or information in a text or part of a text.

The unit was developed in three separate stages during the first semester of the school year. In the first stage, a set of essential questions were developed to guide student inquiry throughout the unit. Here, learning objectives were generated identifying what students were expected to master by the end of the unit. During stage two, the teachers established a set of performance tasks and other types of evidence that students could complete to demonstrate mastery of the unit’s learning objectives. Five unit assessments including a pretest, two formative assessments (e.g., informal assessments used to gauge students’ progress toward mastering the learning objectives), and two summative assessments were also constructed. Detailed plans of learning activities aimed to facilitate students’ mastery of the unit goals were completed during the third phase of unit development. It was agreed that instructional routines would follow a general pattern of:

---

5 RI.4.5 = Reading Information, 4th grade, Standard 5.
1. Direct instruction
2. Guided practice
3. Small-group practice
4. Independent practice

Lesson duration, difficulty of texts, activities, and other assignments were adjusted within classes to meet the learning needs of student groups. All students completed the exact same unit assessments on the same school days.

Two weeks before the start of the unit, students took the unit pretest to assess prior knowledge of informational text structures and to provide a baseline measure of calibration via item-level confidence judgments. The pretest consisted of 10 reading selections ranging from a single paragraph to one page in length each representing characteristics of one of four targeted text organizational patterns (i.e., chronology, comparison, cause-effect, and problem-solution) and 13 multiple-choice comprehension questions. All participants provided item-level confidence judgments after answering each test question by drawing a slash through a 100-mm line that was labeled 0% Sure on the left end and 100% Sure on the right end. No instruction about confidence judgments had been provided to any participant when students completed the unit pretest.⁶

Students completed the informational text structures unit over the same five consecutive weeks during the final quarter of the school year (i.e., the last nine-weeks). Two and one-half weeks (i.e., 13 instructional days) were spent teaching students about cause-effect and compare-contrast text structures. Students took the first summative assessment during week three. This

---

⁶ This was the second time that students had made confidence judgments for reading comprehension test items. They first provided confidence judgments on a site-developed fourth grade reading pretest administered during the first week of September.
test assessed students’ mastery of the two organizational patterns targeted during the first half of the unit: cause-effect and compare-contrast. The test consisted of six reading selections ranging from a single paragraph to one and a quarter pages in length and 13 multiple-choice questions. All students provided confidence judgments following each test item exactly as they did on the unit pretest.

Following the first summative assessment, students received two weeks of instruction about chronology and problem-solution text structures (i.e., 10 instructional days). They completed the second summative assessment at the end of week five. This test was constructed to assess students’ mastery of the two organizational patterns targeted during the second half of the unit: chronology and problem-solution. It consisted of three reading selections ranging from a single page to one and a quarter pages in length and 13 multiple-choice questions. All students provided confidence judgments following each test item exactly as they did on the other unit tests.

Students in the control condition received regular reading instruction from their classroom teacher in accordance with the state’s adopted curriculum (i.e., Common Core State Standards for Reading) and the district’s pacing guides. The curriculum explicitly lists supporting answers to comprehension questions using evidence from the text as part of reading instruction. The school-wide literacy plan also encouraged ELA teachers to incorporate a common set of test-taking strategies for reading.
Known as Runners, strategies included:

- Read the title
- Underline key words in questions
- Number the paragraphs
- Now read the selection
- Eliminate wrong answer choices
- Research the text to find the correct answer and highlight the answer in the text
- Select the best answer

Students first learned the Runners strategy during third grade (i.e., 2013-14 school year). While I did not implement this strategy with my two classes, students in the control condition continued using the Runners strategies throughout the 2014-15 school year.

**Instruction about Confidence Judgments**

While students in both groups (i.e., intervention and comparison) experienced some of the same learning activities and completed identical assessments before, during, and after the informational text structures unit, those in the metacognitive group were taught to use confidence judgments as an additional way to monitor comprehension while reading. This instruction supplemented other monitoring strategies that students were taught throughout the school year including: (a) identifying main ideas, (b) summarizing, (c) locating key details, (d) making connections, and (e) generating questions, among others.

The introductory lesson about the use of confidence judgments to monitor comprehension occurred over two consecutive school days during the latter half of the first week of the text structures unit. A major goal of this lesson was for students to understand how confidence judgments are useful for comprehension monitoring.
Instruction began by asking students to recall making confidence judgments on the informational text structures unit pretest two weeks prior to this lesson. To stimulate recall, the guide for making confidence judgments that was used just before the text structures unit pretest was displayed. Students were prompted to think about reasons they might make confidence judgments for test items. After individually recording ideas in their Reading Notebooks, students shared and discussed ideas within their learning teams. Next, the teacher engaged students in a whole group discussion about using confidence judgments as an additional strategy for monitoring comprehension.

After discussing the use of confidence judgments as a tool for comprehension monitoring, students read a one-page article about television cartoons and completed associated text work in their learning teams. Next, students independently answered two multiple-choice questions about the article’s text structure and provided a confidence judgment for each. The researcher measured all confidence judgments prior to going over the answers as a whole-group. After discussing the correct answers, students were encouraged to compare their level of confidence with their actual performance on the two items. This discussion used three questions that were used in an earlier study (Huff & Nietfeld, 2009, p. 169):

1. What does your confidence rating suggest about your comprehension of the text?
2. Compare your confidence rating with your actual performance. Were you under- or overconfident?
3. How might thinking about your level of confidence for answers to reading comprehension questions improve your score?

Following the introductory lesson about confidence judgments, students practiced using confidence judgments and engaged in discussions about the new monitoring tool. They were
encouraged to try to improve the accuracy of confidence judgments on subsequent practice passages and the two text structures unit summative assessments with the goal of using monitoring information to increase comprehension (Huff & Nietfeld, 2009).

After the first text structures unit summative assessment which was administered during the early part of week three, students were given self-monitoring checklists called Stop & Think Cards as they continued to practice making confidence judgments during the last two weeks of the unit. These self-monitoring checklists, shown in Figure 12, were adapted versions of those used in an earlier study (Huff & Nietfeld, 2009).

Stop & Think

☐ Do I understand what this part was about?
☐ Were there any parts I did not understand?
☐ Could I explain what I have just read to someone else?
☐ What might the next section be about?
☐ Are there any questions I need to have answered?

Figure 12. Stop and Think Card
**Data Analysis**

The primary purpose of this study was to examine the effects of metacognitive strategy instruction emphasizing monitoring and control processes on participants’ reading achievement and calibration accuracy compared with students who did not receive the same specialized instruction. Analytical methods included correlational analysis, *t*-tests, and hierarchical multiple regression. A brief discussion of the main analysis procedures is presented in the next two sections. These procedures and additional analytical processes are fully described in the subsequent chapter.

**Screening, Diagnostics, and Model Assumptions**

The first process for data analysis involved exploratory data screening through graphical displays and computation of descriptive statistics and correlations for variables across the two conditions and among the four classes in the study. These procedures were necessary for identifying possible deficiencies within the dataset that would need to be addressed prior to running the main analyses. They also provided a general overview of the relationships between the variables. Prior to conducting statistical significance tests, relevant model assumptions were checked. Reliability estimates were calculated for each measure and effect sizes are reported for each test, as appropriate.

**Statistical Tests of Significance**

A series of hierarchical multiple regression models were used to examine the influence of condition (i.e., intervention and comparison) on reading achievement and calibration. This variant of the linear multiple regression procedure allows specification of a fixed order of entry for variables to control for the effects of covariates. In other words, the hierarchical regression method enables testing the effects of specified predictors independent of the influence of others.
This was an important consideration in the current study given the nonequivalent quasi-experimental design. The first sequence of hierarchical regression models was employed where:

\[
\text{DV: } Y = A_{post} \text{ (Current Year Achievement)}
\]

\[
\text{IVs: } X_1 = A_{pre} \text{ (Prior Year Achievement)}
\]

\[
X_2 = S \text{ (Struggling Reader Status)}
\]

\[
X_3 = C \text{ (Condition) and SxC (Struggling Reader Status x Condition)}
\]

Prior Year Achievement was entered in Step 1 to explain its effect on Current Year Achievement and partial out that effect. Struggling Reader Status was entered in Step 2 to explain its effect on Current Year Achievement independent of Condition. Struggling Reader Status was dichotomized where 0 = non-struggling readers and 1 = struggling readers. Finally, Step 3 included Condition and the cross-product term for Struggling Reader by Condition. Condition was added in Step 3 to explain the effects of Metacognitive Strategy Instruction on Current Year Achievement after removing the effects of Prior Year Achievement. Since the achievement variables did not have a meaningful 0, they were standardized as z-scores to facilitate interpretation of the beta coefficients. Condition was dichotomized where the Control Group = 0 and the Treatment Group = 1. The cross-product term was added at Step 3 to test for a possible interaction between reading level and condition in their effects on Current Year Achievement.

A second set of hierarchical regression models was used to determine the influence of metacognitive strategy instruction on reading growth. It was expected that growth in reading achievement would occur across both groups, but that students who received metacognitive strategy instruction would display larger gains in reading achievement compared with those receiving standard reading instruction. This was expected to be especially true for struggling
readers (i.e., students who were struggling to meet reading proficiency). To determine whether reading proficiency status modified the relationship between metacognitive strategy instruction and current year achievement, an interaction term (i.e., Reading Proficiency Status x Current Year Achievement) was tested using Andrew Hayes’s Process macro (Darlington & Hayes, 2017). Current Year Achievement was mean centered prior to moderation analysis.

Baseline confidence, calibration accuracy, and bias scores were calculated using students’ confidence judgments from the informational text structures unit pretest. Follow up confidence, calibration accuracy, and bias scores were computed from students’ confidence judgments provided on the two summative assessments from the informational text structures unit (i.e., scores were aggregated across the two tests). T-tests were used to compare means for confidence and calibration indices by condition which were followed by regression analysis.
CHAPTER 4: Results

This research examined the effects of metacognitive strategy instruction on fourth graders’ reading achievement and calibration compared with students who did not receive metacognitive strategy instruction or training in the use of confidence judgments. The impact of metacognitive strategy instruction on standardized comprehension test scores and calibration was analyzed using t-tests and hierarchical multiple linear regression. The criterion for statistical significance was set to $\alpha \leq .05$ for all analyses. Analyses were conducted using three software programs:

1. SPSS (IBM Corp., 2015)
3. Tableau Desktop Professional (Tableau Software, 2018)

This chapter begins with a presentation of preliminary analyses including correlations among the variables and descriptive statistics, followed by main analyses for each research hypothesis.

Preliminary Analyses

Before addressing each hypothesis, preliminary analyses were conducted to provide descriptive statistics for the primary variables and to determine whether significant between group differences existed on pretest measures. First, bivariate correlations and descriptive statistics were examined. Next, a series of independent samples t tests were conducted to compare mean scores between the control group and intervention group on the following continuous pretest measures: (1) prior year achievement (i.e., 3rd Grade Reading EOG scale scores); (2) text structure pretest scores; (3) text structure pretest confidence; (4) text structure pretest accuracy; and (5) text structure pretest bias. Unless otherwise noted, Levene’s Test for Equality of Variances was not significant. For each t test, Cohen’s $d$ effect size estimates were
calculated and interpreted as small (.20), moderate (.30), or large (.50) effects (Cohen & Cohen, 1983).

**Bivariate Correlations**

Most of the study’s variables were significantly correlated. Correlations for the entire study sample are shown in Table 11, while correlations for the control group and treatment group are displayed in Tables 12 and 13, respectively. As shown in Table 11, the largest correlation across the study sample was observed between composite posttest scores on the text structures summative assessments and posttest accuracy, $r = -.843, p < .01$. The negative correlation is expected since accuracy scores closer to zero indicate greater accuracy. Prior Year Achievement (3rd Grade EOG Scale Scores) and Current Year Achievement (4th Grade EOG Scale Scores), were also moderately correlated, $r = .817, p < .01$. Among the control group, the strongest correlation was between scores and accuracy on the text structures summative assessment composite, $r = -.905, p < .01$ (see Table 12). These same variables were moderately correlated among students in the treatment group, $r = -.818, p < .01$ (refer to Table 13). Prior Year Achievement (3rd Grade EOG Scale Scores) and Current Year Achievement (4th Grade EOG Scale Scores) were moderately correlated for the control group, $r = .645, p < .01$ and strongly correlated for the treatment group, $r = .882, p < .01$. 
Table 11

Correlation Coefficients among Variables for the Study Sample (N = 63)

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>.452**</td>
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<td>5. Pretest Accuracy</td>
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<td>-.376**</td>
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<td>6. Pretest Bias</td>
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<td>-.232</td>
<td>-.537**</td>
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<td>7. Posttest Score</td>
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<td>.574**</td>
<td>.560**</td>
<td>.278*</td>
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<td>8. Posttest Confidence</td>
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<td>.320*</td>
<td>.258*</td>
<td>.397**</td>
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<td>9. Posttest Accuracy</td>
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<td>-.611**</td>
<td>-.620**</td>
<td>-.475**</td>
<td>.274*</td>
<td>.149</td>
<td>-.843**</td>
<td>-.633**</td>
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<td>10. Posttest Bias</td>
<td>-.316*</td>
<td>-.254*</td>
<td>-.289*</td>
<td>.063</td>
<td>-.011</td>
<td>.338**</td>
<td>-.671**</td>
<td>.542**</td>
<td>.247</td>
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</tbody>
</table>

Note. *p < .05; **p < .01 (two-tailed).
Table 12

*Correlation Coefficients among Variables for the Control Group (N = 30)*

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<th>Measure</th>
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<th>3</th>
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<td>.645**</td>
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<tr>
<td>3. TS Pretest Score</td>
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<td>.558**</td>
<td>.543**</td>
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</tr>
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<td>4. TS Pretest Confidence</td>
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<td>5. TS Pretest Accuracy</td>
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<td>6. TS Pretest Bias</td>
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<td>7. TS Tests Score</td>
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<td>.469**</td>
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<td>8. TS Tests Confidence</td>
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<td>9. TS Tests Accuracy</td>
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<td>.106</td>
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<td>10. TS Tests Bias</td>
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<td>-.540**</td>
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*Note.* *p*<.05; **p*<.01 (two-tailed).
Table 13

*Correlation Coefficients among Variables for the Treatment Group (N = 33)*

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<th>Measure</th>
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<td>1. 4thEOG Scale</td>
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<tr>
<td>3. TS Pretest Percent Correct</td>
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<td>4. TS Pretest Confidence</td>
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<td>.448*</td>
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<td>5. TS Pretest Accuracy</td>
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<td>-.423*</td>
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<td>6. TS Pretest Bias</td>
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<tr>
<td>8. TS Tests Confidence</td>
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<td>.307</td>
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<td>.181</td>
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*Note.* *p*<.05; **p**<.01 (two-tailed).
Group Comparisons on Baseline Measures

A series of independent-samples t-tests were used to compare scores on baseline measures prior to introducing metacognitive strategy instruction and before providing monitoring accuracy training in the treatment group. Means and standard deviations for baseline measures are presented in Table 14.

Table 14

*Descriptive Statistics for Baseline Measures by Condition*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Comparison</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>3rd Grade EOG</td>
<td>445.80*</td>
<td>5.43</td>
</tr>
<tr>
<td>TS Pretest¹</td>
<td>0.68</td>
<td>0.14</td>
</tr>
<tr>
<td>Pretest Confidence</td>
<td>69.27</td>
<td>12.69</td>
</tr>
<tr>
<td>Pretest Accuracy</td>
<td>0.32</td>
<td>0.09</td>
</tr>
<tr>
<td>Pretest Bias</td>
<td>0.02</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Note. *p < .05 level; ¹Percent correct.

Students in the comparison group scored significantly higher (N = 30, M = 445.80, SD = 5.43) on the 3rd Grade Reading EOG than those in the treatment group (N = 33, M = 439.39, SD = 11.98), t (61) = 2.78, p = .008; d = 0.69). Levene’s Test for Equality of Variances was significant for the Text Structures Unit Pretest, F (5.67), p = .020, indicating that equal variances could not be assumed for the measure; thus, results for the independent samples t-test on this variable are reported for unequal variances. There was no statistically significant difference between mean text structure pretest scores of students in the comparison group (N = 30, M = 8.80, SD = 1.79) and those in the treatment group (N = 33, M = 8.09, SD = 2.75); t (61) = 1.22, p = .227; d = 0.31.
Confidence

Results from an independent samples t-test comparing text structure pretest confidence scores indicated no statistically significant difference between mean Text Structure Pretest confidence scores of students in the comparison group ($N = 30, M = 69.27, SD = 12.69$) and those in the treatment group ($N = 33, M = 63.91, SD = 21.22$); $t (61) = 1.20, p = .234; d = 0.31$.

Accuracy

Results from an independent samples t-test comparing text structure pretest calibration accuracy scores indicated non-significant statistical differences between students in the comparison group ($N = 30, M = .33, SD = 0.092$) and those in the treatment group ($N = 33, M = 0.37, SD = 0.132$); $t (61) = -1.325, p = .190; d = 0.35$.

Bias

Results of the independent samples t-test revealed no statistically significant difference between the mean text structure pretest bias scores of students in the comparison group ($N = 30, M =0.02, SD = 0.14$) and those in the treatment group ($N = 33, M = 0.02, SD = 0.22$), $t (61) = -0.019, p = .985; d = 0$. 
Main Analyses

In this research, the impact of teaching reading using a metacognitive framework over a nine-month school year on fourth graders’ reading achievement, after accounting for the effects of prior year reading achievement, was compared to reading achievement of students who received their teacher’s regular reading instruction. Additionally, the effects of teaching students to use confidence judgments as a monitoring tool on their calibration (i.e., accuracy and bias) was evaluated compared with students who did not receive monitoring instruction. Hypotheses were analyzed using hierarchical multiple linear regression and independent samples t-tests. This section contains descriptive statistics and analyses related to the research hypotheses for the study.

Hypothesis One: Reading Achievement

It was hypothesized that using a metacognitive framework to teach English Language Arts and Social Studies over one nine-month school year would positively impact fourth graders’ reading achievement. It was further hypothesized that students in the treatment group would show more growth in reading achievement compared with those in the comparison group. It was also predicted that achievement gains would be more pronounced for struggling readers who received metacognitive strategy instruction. Descriptive statistics for current year achievement and achievement gains are presented in Table 15.
Table 15
Descriptive Statistics for Current Year Achievement and Achievement Gains by Condition and Class.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Comparison</th>
<th></th>
<th>Intervention</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td>4th Grade EOG</td>
<td></td>
<td>452.90</td>
<td>6.79</td>
<td>449.48</td>
</tr>
<tr>
<td>EOG Gains</td>
<td></td>
<td>7.10</td>
<td>5.29</td>
<td>10.28*</td>
</tr>
</tbody>
</table>

*Note. *p < .05

Hierarchical multiple regression was used to investigate the extent to which metacognitive strategy instruction explained current year achievement between the two conditions and as a function of struggling reader status. A three-stage hierarchical regression was employed to test the effects of instruction on students’ reading achievement as a function of struggling reader status. Struggling reader status was dichotomized such that 0 = non-struggling readers and 1 = struggling readers. Predictors were entered into the regression model in three steps:

Step 1: Prior Year Achievement (3rd Grade EOG Scale Scores)

Step 2: Condition (Control = 0, Treatment = 1) and Struggling Reader Status (Not Struggling = 0, Struggling = 1)

Step 3: Condition x Struggling Reader Status

Results of the regression analysis are displayed in Table 16.
Table 16

*Hierarchical Regression Analysis for Variables Explaining Current Year Reading Achievement*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>( R^2 )</th>
<th>( R^2_{adj} )</th>
<th>( \Delta R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Year Achievement</td>
<td>0.69</td>
<td>0.06</td>
<td>.87</td>
<td>11.08***</td>
<td>.69</td>
<td>.66</td>
<td>.67***</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Year Achievement</td>
<td>0.62</td>
<td>0.09</td>
<td>.74</td>
<td>6.49***</td>
<td>.68</td>
<td>.66</td>
<td>.01</td>
</tr>
<tr>
<td>Struggling Reader Status</td>
<td>-2.26</td>
<td>1.96</td>
<td>-.13</td>
<td>-1.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>1.15</td>
<td>1.29</td>
<td>.07</td>
<td>0.894</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prior Year Achievement</td>
<td>0.66</td>
<td>0.12</td>
<td>.79</td>
<td>5.74***</td>
<td>.68</td>
<td>.66</td>
<td>.00</td>
</tr>
<tr>
<td>Struggling Reader Status</td>
<td>-2.93</td>
<td>2.30</td>
<td>-.17</td>
<td>-1.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>0.68</td>
<td>1.53</td>
<td>.04</td>
<td>0.45</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition x Struggling Reader Status</td>
<td>-8.37</td>
<td>3.47</td>
<td>.10</td>
<td>-2.41*</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* \( N = 63; \)** *p* < .001

Overall, the model explains 68% of the variance in current year achievement scores (4th Grade EOG scale scores), \( R^2_{adj} = .66, F \) (4, 62) = 30.98, \( p = .000 \). Consistent with my prediction, prior year achievement is positively associated with current year achievement, \( b = 0.66, t \) (62) = 5.74, \( p = .000 \). Every one-point increase in prior year achievement is associated with an estimated 0.66-point increase in current year test scores. Struggling reader status did not reach statistical significance in relation to current year achievement, \( b = -2.93, t \) (62) = -1.28, \( p = .207 \).

While condition is positively associated with current year achievement, its influence is not statistically significant in relation to current year achievement, \( b = 0.68, t \) (62) = 0.45, \( p = .658 \). Finally, as predicted, there is a significant interaction between struggling reader status and condition, \( b = -8.37, t \) (62) = -2.42, \( p = .02 \). The interaction is displayed in Figure 13.
It was hypothesized that students in the treatment condition would show greater gains in reading achievement than those in the comparison group and that gains would be more pronounced for struggling readers. Gain scores were calculated by subtracting students’ 3rd Grade EOG scale scores from their 4th Grade EOG scale scores. An independent samples $t$-test was conducted to determine whether a significant difference existed between the mean EOG gain scores of students identified as struggling readers within the comparison group and those in the treatment group. Struggling readers in the treatment group demonstrated significantly greater mean achievement gains ($n = 15, M = 13.47, SD = 5.08$) than those in the comparison group ($n = 7, M = 5.71, SD = 4.31$), $t (20) = -3.482, p = .002; g = 1.60$. Because the sample sizes differed greatly, the effect size for this analysis was computed using Hedge’s $g$.

Results from an independent samples $t$-test indicated that struggling readers in the treatment group made significantly greater gains on the text structures unit posttest (i.e., composite summative test scores) ($n = 7, M = -1.00, SD = 2.38$) than those in the comparison
group \( (n = 15, M = 1.81, SD = 2.74) \), \( t (21) = -2.35, p = .0291, g = 1.07 \). Hedge’s \( g \) was calculated as the measure of effect size because of the difference in sample size between the two groups.

Gain scores were also analyzed via a three-stage hierarchical linear regression. Condition was entered in step one, struggling reader status in step two, and the interaction term condition x struggling reader status in step three. Results are shown in Table 17 and the interaction is displayed in Figure 14. The model accounts for approximately 18\% of the variance in achievement gains, \( R^2_{adj} = 0.18, F (1, 62) = 5.60, p = .002 \). Consistent with my hypothesis, the treatment condition was positively associated with achievement gains, \( b = 2.99, p = .04 \). Students in the treatment group gained approximately 3 points more than those in the comparison group on the 4\textsuperscript{th} Grade Reading EOG. Also consistent with my hypothesis, struggling reader status significantly moderates the relationship between achievement gains and condition. Struggling readers in the treatment condition gained approximately 7 more points on the 4\textsuperscript{th} Grade EOG than struggling readers in the comparison group.
Table 17

Hierarchical Regression Analysis for Variables Explaining Gains in Reading Achievement

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>$R^2$</th>
<th>$R^2_{adj}$</th>
<th>∆$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition</td>
<td>2.99</td>
<td>1.40</td>
<td>.26</td>
<td>2.13</td>
<td>.07</td>
<td>.05</td>
<td>.07*</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.14</td>
<td>.12</td>
<td>.07*</td>
</tr>
<tr>
<td>Condition</td>
<td>2.13</td>
<td>1.41</td>
<td>.19</td>
<td>1.51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Struggling Reader Status</td>
<td>3.39</td>
<td>1.49</td>
<td>.28</td>
<td>2.27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.22</td>
<td>.18</td>
<td>.08*</td>
</tr>
<tr>
<td>Condition</td>
<td>-8.82</td>
<td>1.61</td>
<td>.00</td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Struggling Reader Status</td>
<td>-1.17</td>
<td>2.36</td>
<td>-.10</td>
<td>-0.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition x Struggling Reader Status</td>
<td>7.23</td>
<td>2.97</td>
<td>.54</td>
<td>2.43</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. $N = 63; *p < .05$

Figure 14. Gains in reading achievement by condition as a function of struggling reader status.
Hypothesis Two: Calibration

It was hypothesized that an emphasis upon monitoring and control processes including training in the use of confidence judgments would improve students' calibration accuracy compared to those who did not receive monitoring instruction or training in the use of confidence judgments. All participants ($N = 63$) provided local (i.e., item-level) confidence judgments for comprehension questions on the text structures unit pretest and summative tests (i.e., Text Structures Posttest). Those in the treatment group ($N = 33$) received explicit instruction about using confidence judgments as a tool for comprehension monitoring for five weeks. Descriptive statistics for confidence and calibration measures are provided in Table 18.
Table 18

*Means and (Standard Deviations) of Pre and Post Scores across Conditions for Text Structures Unit Measures*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Pretest Performance</th>
<th>Posttest Performance</th>
<th>Pretest Confidence</th>
<th>Posttest Confidence</th>
<th>Pretest Accuracy</th>
<th>Posttest Accuracy</th>
<th>Pretest Bias</th>
<th>Posttest Bias</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (N = 30)</td>
<td>67.70 (0.14)</td>
<td>74.23 (12.78)</td>
<td>69.27 (12.69)</td>
<td>84.66 (12.33)</td>
<td>0.32 (0.09)</td>
<td>0.30 (0.13)</td>
<td>0.02 (0.14)</td>
<td>0.21 (0.26)</td>
</tr>
<tr>
<td>Treatment (N = 33)</td>
<td>62.24 (0.21)</td>
<td>78.21 (15.46)</td>
<td>63.91 (21.22)</td>
<td>80.1 (12.41)</td>
<td>0.37 (0.13)</td>
<td>0.30 (0.13)</td>
<td>0.02 (0.22)</td>
<td>0.02 (0.36)</td>
</tr>
<tr>
<td>Overall (N = 63)</td>
<td>64.84 (0.18)</td>
<td>76.31 (14.28)</td>
<td>66.47 (17.75)</td>
<td>81.69 (12.61)</td>
<td>0.34 (0.11)</td>
<td>0.30 (0.13)</td>
<td>0.02 (0.19)</td>
<td>0.12 (0.33)</td>
</tr>
</tbody>
</table>

*Note.* Scores for test performance are reported as percent correct.
Confidence

How did an emphasis upon monitoring and control processes with training in the use of confidence judgments affect students’ confidence?

This question examined the extent to which explicit instruction in the use of confidence judgments impacted confidence scores on the text structures unit comprehension tests. Results from an independent samples t-test comparing text structure pretest confidence scores indicated no statistically significant difference between mean confidence scores of students in the comparison group \((N = 30, M = 69.27, SD = 12.69)\) and those in the treatment group \((N = 33, M = 63.91, SD = 21.22)\); \(t(61) = 1.20, p = .234; d = 0.31\). A second independent samples t-test comparing text structure posttest confidence scores revealed no statistically significant difference between mean confidence scores of students in the comparison group \((N = 30, M = 84.66, SD = 12.33)\) and those in the treatment group \((N = 33, M = 80.01, SD = 12.41)\); \(t(61) = 1.81, p = .075\).

Accuracy

How did an emphasis upon monitoring and control processes with training in the use of confidence judgments affect students’ accuracy?

Results from an independent samples t-test comparing Text Structure Pretest calibration accuracy scores indicated non-significant statistical differences between students in the comparison group \((N = 30, M =.33, SD = 0.092)\) and those in the treatment group \((N = 33, M = 0.37, SD = 0.132)\); \(t(61) = -1.325, p = .190; d = 0.35\). Results from a second independent samples t-test comparing Text Structure Posttest calibration accuracy showed a statistically non-significant difference between mean posttest calibration accuracy for students in the comparison group \((N = 30, M =0.30, SD = 0.13)\) and those in the treatment group \((N = 33, M = 0.30, SD = 0.13)\); \(t(61) = -0.015, p = 0.988\).
I also conducted a multiple regression analysis to determine how much variance in calibration accuracy could be explained, controlling for other predictors of interest. Overall, the model explains 38% of the variance in children’s calibration accuracy, \( R^2_{\text{adj}} = .38, F (3, 62) = 13.67, p = .000 \). The effect of condition approached statistical significance; calibration accuracy among students in the treatment group improved, \( b = -0.05, t (62) = -1.84, p = .71 \). Struggling readers were less accurate than non-struggling readers, \( b = .16, t (62) = 5.76, p = .000 \).

**Bias**

*How did an emphasis upon monitoring and control processes with training in the use of confidence judgments affect students’ calibration bias?*

Results of an independent samples *t*-test revealed no statistically significant difference between the mean pretest bias scores of students in the comparison group (\( N = 30, M =0.02, SD = 0.14 \)) and those in the treatment group (\( N = 33, M = 0.02, SD = 0.22 \)), \( t (61) = -0.019, p = 0.985; d = 0 \). Results from a second independent samples *t*-test comparing Text Structure Posttest calibration accuracy showed a statistically significant difference between mean posttest bias scores of students in the comparison group (\( N = 30, M =0.21, SD = 0.26 \)) and those in the treatment group (\( N = 33, M = 0.02, SD = 0.36 \)), \( t (61) = 2.42, p = 0.02 \).
CHAPTER 5: Discussion

This chapter begins with a summary of the study’s goals and major findings. Findings are discussed in relation to related research, which is followed with a presentation of implications for educators, policy makers, and university teacher education programs. The chapter concludes with a discussion of the study’s limitations and recommendations for future work.

Summary of Study Goals and Findings

This research investigated the effects of using a metacognitive instructional framework for literacy instruction on 4th graders’ reading achievement. It also examined the impact of direct instruction about using confidence judgments as a comprehension monitoring strategy on participants’ calibration. Students in the treatment group (N = 33) received multicomponent strategy instruction that integrated declarative, procedural, and conditional knowledge to support their development of strategic reading processes, metacognition and self-regulation. Conversely, students in the control group (N = 30) received reading instruction characteristic of their teacher’s standard methods. Although the calibration component of this dissertation zeroed in on a 5-week informational text structures unit, the study was designed as a year-long intervention with broader goals for the student participants which were to (1) foster children’s development and understanding of strategic reading processes; (2) improve reading self-efficacy; (3) increase academic motivation; (4) build metacognitive knowledge; (5) provide a foundation for self-regulated learning processes; and (6) encourage application of learning strategies in other content areas including Social Studies and Science.

Current year reading achievement was analyzed using scores on the Grade 4 North Carolina READY Reading End-of-Grade test and composite performance on two classroom-based summative assessments. Metacognitive monitoring was measured via calibration accuracy
and bias scores calculated using students’ confidence judgments provided for items on classroom-based reading comprehension tests. Because intact classes were used in this research and randomization was not possible, pretests were used to determine whether significant differences in reading achievement and calibration existed between the comparison and treatment groups prior to beginning the instructional intervention and implementation of confidence judgment lessons. An independent samples t-test indicated a significant difference between the control and treatment groups only on the Grade 3 North Carolina READY Reading End-of-Grade test. Students in the comparison group scored significantly higher \((N = 30, M = 445.80, SD = 5.43)\) on the 3rd Grade Reading EOG than those in the treatment group \((N = 33, M = 439.39, SD = 11.98)\). Therefore, prior year achievement was statistically controlled for in subsequent regression analyses.

To determine which variables were related and whether regression and t-tests were appropriate methods to test the study’s hypotheses, correlations were calculated between prior year achievement, current year achievement, text structures unit test scores, confidence, calibration accuracy, and calibration bias. Moderate to strong correlations were found among most of these variables. Since previous research suggests that reading proficiency is associated with effects of metacognitive oriented reading instruction and metacognitive monitoring, a struggling reader flag was created such that typically achieving readers were coded with 0 and struggling readers were coded as 1. This variable was tested as a potential moderator in the regression analysis that assessed the impact of condition upon reading achievement. A three-stage hierarchical regression approach was used to test the effects of using a metacognitive framework to teach English Language Arts and Social Studies over one school year on students’ reading achievement after accounting for the effects of prior year achievement. Results indicated
that prior year reading achievement accounted for 68% of the variance in current year reading achievement and adding condition in the second step did not account for a significant amount of additional variance. A significant interaction was found for struggling reader status, indicating that current year achievement varied as a function of condition and struggling reader status.

**Discussion of Findings**

**Hypothesis One**

The first hypothesis in this study tested whether variability in current year reading achievement scores could be explained by instructional method. This study did not find that a statistically significant amount of variance in current year reading achievement is explained by condition after accounting for prior year achievement. This result is consistent with findings from other studies using standardized reading assessments. For example, in Donker and colleagues’ (2014) recent meta-analysis investigating the efficacy of learning strategy instruction on academic performance, effects were higher for self-developed (i.e., classroom-based) tests than for standardized reading tests. Similarly, in a study investigating whether the effects of metacognitive instruction on comprehension depended on the type of measurement instrument, Chiu (1998) found higher effects for non-standardized tests. Regarding gains in reading achievement, this study did find a significant difference in favor of the treatment group. Students in the treatment group showed significantly greater gains in achievement than those in the comparison groups on the 4th Grade North Carolina READY Reading EOG test. This finding partially contrasts one in a similar study by a colleague and I examining the impact of metacognitive strategy instruction on fifth graders’ reading performance. Students’ scores on a standardized comprehension test significantly improved across all conditions; there was no
significant interaction between intervention conditions and control conditions (Huff & Nietfeld, 2009).

**Hypothesis Two**

The second hypothesis in this study tested whether an emphasis upon monitoring and control processes with training in the use of confidence judgments affected students’ calibration in terms of accuracy and bias. This study found a significant difference in students’ bias in the expected direction but not for accuracy. Students in the treatment group became significantly less biased in their confidence judgments than those in the comparison group. Specifically, these children became significantly less overconfident than those in the control group. This finding is unique considering those reported by Huff and Nietfeld (2009) in which students who received comprehension monitoring training via confidence judgments showed a significant increase in bias towards overconfidence. Indeed, we suggested that the finding warranted additional work examining the impact of comparing perceived confidence with actual performance among students in upper elementary grades. We conjectured the possibility that the finding might reflect a developmental phenomenon whereby students at this age may not have the skills necessary to accurately judge their performance. Findings from the current study suggest otherwise.

**Implications**

The theoretical framework and instructional methods used in this study, along with key findings have implications for classroom teachers, teacher preparation programs, and policy makers. First, it is important for classroom teachers to explicitly teach and consistently integrate metacognitive reading strategies that support children’s development of monitoring and control processes which are important precursors of self-regulated learning. This is because they are the very mechanisms that learners use to kickstart SRL. The most cited models of SRL share this
idea. For example, during the second phase of Zimmerman’s model, the performance phase, learners engage in self-monitoring which, in turn, activates metacognitive processes. In Winne and Hadwin’s (1998) informational processing model of SRL, monitoring and control processes are explicated in all stages of learning events. In line with social cognitive learning theory, teachers should model the skills for students while thinking aloud to them the opportunity to observe how expert readers use metacognitive processes. Additionally, having student leaders model strategy use and think aloud provides a powerful opportunity for peers to observe their classmates’ thinking and processes for tackling complex texts. Teachers should also provide scaffolds through tactics such as self-monitoring checklists and other visual cues for students to use during reading. Helping students learn, practice, and apply metacognitive strategies before, during, and after reading should be mainstays in elementary school classrooms.

With respect to teacher preparation programs, it is imperative that university professors explicitly teach the concepts of metacognition and self-regulation to up-and-coming teachers. Not only that, future teachers should engage in activities that help them recognize and explain their metacognitive thought processes. These types of experiences in teacher education classes are essential because they help future teachers develop an understanding of the importance of integrating metacognitive and self-regulatory learning strategies throughout content areas. Thereby, these soon-to-be practitioners gain the skills necessary to teach the same kinds of processing to their future students.

Regarding the applicability of this research to policy, providing funding for professional development to teach classroom teachers about metacognition and self-regulation would be a valid investment. In ten years of classroom teaching across four different schools in two districts, I was not offered a single opportunity to learn about metacognition or self-regulation from site or
district-based professional development. From my experience, required professional development tends to lack rigor and relevancy. Sessions tend to occur over short periods of time (i.e., a single day or a half-day) throughout a given school year and topics often vary each time, precluding deep understanding and application of subject matter in classrooms. Rather than providing fragmented professional learning sessions schools and districts might consider restructuring programs to reflect characteristics of effective teaching and learning. Applying effective adult learning principles would be an important starting point as would be providing rigorous courses grounded in metacognitive theory and research. School and district employees need staff development opportunities for in-service teachers to learn about metacognition and SRL. Education must evolve to integrate metacognitive thinking into the learning process of children so that they can be more successful on mandated testing; to prevent certain children from being left behind because they were unaware of how to learn properly. Until this is done, it appears there will be children left behind because they were not taught the proper learning techniques. Academics and administrators must focus on this concept if they want to improve outcomes of students in the United States. Moving students toward College and Career Readiness advocated in the Common Core State Standards would be greatly improved by teaching children how to learn.

Limitations

While the quasi-experimental nonequivalent control group design used in this study prevented disruption of existing classroom settings thereby reducing reactive effects and improving external validity of results, it also presents greater sensitivity to internal validity issues. For example, interaction between factors such as maturation, history, and differences in reading proficiency levels at the start of the study might affect internal validity. Therefore,
between group differences could be attributable to inherent group differences rather than the intervention. The lack of randomization makes it challenging to isolate the effects of the intervention. The internal validity in this study was threatened due to the sampling method and lack of randomization inherent in the quasi-experimental nonequivalent group design. The study employed a convenience sample of intact classes within the same school. Using intact classes of students may have introduced selection bias since children were assigned to homerooms based largely upon their prior year reading achievement. Students in the comparison group showed a significantly higher mean score on prior year reading achievement measured by the 3rd grade Reading EOG than those in the treatment group. Additionally, there was a large difference in the number of struggling readers per condition, with a disproportionate number of struggling readers in the treatment group (n = 15) compared to the comparison group (n = 7). With the understanding that using pretests is essential in quasi-experimental studies (Slavin, 2007), participants in this study completed pretests for each dependent variable prior to treatment implementation. Statistically non-equivalent reading achievement between the two conditions may have introduced bias into the sample. Additionally, a larger sample size would increase the generalizability of the study (Babbie, 2015). Finally, the method used to measure calibration (i.e., students making slash marks on 100-mm lines with anchors at either end) in this research could have introduced validity issues given that students may have had difficulty determining precise locations for marking their confidence judgments. For example, a student might have thought he was 75% sure of his answer but marked the line at 83%. The guide for making confidence judgments that students were shown prior to completing the text structures pretest was used to help mitigate this potential limitation.
**Recommendations for Future Research**

This study provides evidence supporting the positive impact of immersing students in a classroom setting specifically designed to cultivate strategic reading processes through instructional design inspired by the theories of metacognition, self-regulation, and social-cognition. Not only did students make significant growth on the state’s standardized end-of-grade reading test, they also became better calibrated (i.e., less biased). Additional studies are needed with students of similar ages that are also situated in authentic classroom environments. Commonly situated in laboratories or universities, there is increasing recognition of the need to study metacognition within naturalistic classroom settings (de Bruin & van Gogh, 2012). This study provides a significant contribution to this point. Innovative and integrated research approaches are also needed to help capture the nature of metacognitive processes in complex elementary classroom settings. Future work should include methodological diversity incorporating mixed methods designs, triangulation, and action research projects spearheaded by interested classroom teachers.

Another fruitful avenue for the field is studying metacognitive and SRL processes in reading comprehension as events (Azevedo, 2014; Azevedo, 2009b; Greene & Azevedo, 2009). For example, it would be useful to analyze students’ text work for traces of strategy use that provide evidence of metacognitive and SRL processes. Cutting edge research studying self-regulatory processes as events is taking place within computer-based learning environments (CBLEs). These kinds of studies provide particularly unique insights into students’ metacognitive and self-regulatory processes since they capture seamless log files of students’ behaviors during learning. Scholars should continue down this and similar paths to produce research characterized by state-of-the-art methodological and analytical prowess.
Concerning calibration research, more studies are needed with elementary aged students, like those in this study’s sample. We also need research to look at student characteristics with the goal to differentiate among student groups to see which strategies are the most effective for which type of student (Donker et al., 2014). Along this line, we also need more studies to compare the short-term to long-term outcomes, especially for more complex strategies such as comprehension monitoring (i.e., calibration). Finally, future work should investigate the reliability and stability of judgment accuracy since results in the current literature are mixed and there is shortage of studies focused on these aspects of calibration measurement.
References


APPENDICES
Appendix A

District Approval Letter
August 1, 2014

Jennie Ofstein, IRB Coordinator
Institutional Review Board for the Protection of Human Subjects
North Carolina State University
2701 Sullivan Drive, Suite 240
Raleigh, NC 27695-7514
(919) 515-8754
irb-coordinator@ncsu.edu

Dear Ms. Ofstein,

As principal at [School Name], please accept this letter as documentation of my willingness to act as a site sponsor for Mrs. Jessica M. Lancaster. It is the policy of Sampson County Public Schools that building administrators are responsible for deciding whether or not to support research projects. Accordingly, Mrs. Lancaster has my permission to engage in doctoral research in accordance with North Carolina State University’s guidelines.

Sincerely,
Appendix B

Text Structures Unit Plans
### Stage 1 - Desired Results

**Established Goal:** RI 4.5 Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.

**Understandings:**
- Texts are presented or organized in different ways
- Authors choose specific ways to organize text depending on the topic and desired message.
- Specific sentences, paragraphs, and larger portions of the text relate to each other and the whole

**Essential Questions:**
- Why do author’s need to organize informational text in specific ways?
- How can determining the structure of a text help readers better understand what they have read?
- How does the structure of a text demonstrate an author’s point-of-view regarding the topic?
- How does text structure help us determine the author’s purpose for writing?
- In what ways does the overall organization of a text help connect the ideas within each paragraph?

**Student will know:**
- Organizational structures are used to convey information about a topic
- Essential vocabulary related to text structure (e.g., organization, structure, chronology, comparison, cause/effect, problem/solution)
- Key words can often be found in a text that signal the text structure (e.g., as a result, because, first, second, after that, finally, on the other hand, unlike, similarly)

**Student will be able to:**
- Identify the text structure of a given informational piece
- Cite specific evidence from a given text to support their identification of the organizational pattern
- Analyze a given informational text in order to identify how the author relates specific parts within the text to each other as well as the whole text
- Explain the organizational pattern of a given informational text orally and in writing
- Apply understanding of text structure to compose a piece of writing that adheres to a specified organizational pattern
### STAGE 2: Understanding by Design

<table>
<thead>
<tr>
<th>Performance Task(s):</th>
<th>Other Evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Students will create a bubble map on a given topic that represents each of the four text structures while including at least 3 key words per type of structure that signal the text structure.</td>
<td></td>
</tr>
<tr>
<td>• Students will write a paragraph that is organized according to a specified text structure ensuring the use of key words/phrases.</td>
<td>• Students will read text that represent each of the targeted text structures and identify the text structure in each text and why the author organized the information in the way he/she did.</td>
</tr>
<tr>
<td></td>
<td>• Students will use a highlighter to identify keywords/phrases that indicate the structure of a given paragraph.</td>
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<tr>
<td></td>
<td>• Text Structure Paragraph Sort: Students will sort a set of paragraphs into the correct text structure.</td>
</tr>
<tr>
<td></td>
<td>• Text Structure Quiz</td>
</tr>
<tr>
<td></td>
<td>• Text Structure Summative Assessment</td>
</tr>
</tbody>
</table>
STAGE 3: Understanding by Design

**LEARNING PLAN**

<table>
<thead>
<tr>
<th>Learning Plan (Stage 3) WHERE TO: Acronym that summarizes key elements to consider when designing an effective and engaging learning plan. Defines how you will get to the desire learning in Stage 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Where are your students headed? Where have they been? How will you make sure the students know where they are going?</strong></td>
</tr>
<tr>
<td>(Text Structure Unit Overview)</td>
</tr>
<tr>
<td>When faced with a new text, students can observe the organizational pattern of the text and look for cues to differentiate and pinpoint which of the text structures was used by the author. By doing so, they can organize their thinking to match the structure of the text, allowing for effective comprehension of the subject matter. Upon identifying these words, students must interpret how the author organized his/her writing. Students must know how to explain and correctly identify chronological order, cause and effect, compare and contrast, and problem and solution. Identification of text structure will be modeled as a whole group. First, prior knowledge must be activated. Next, students will have guided practice followed by opportunity for collaborative work. Lastly, students will be given independent work to complete that will assess mastery.</td>
</tr>
<tr>
<td><strong>How will you hook students at the beginning of the unit?</strong></td>
</tr>
<tr>
<td>(1-2 days)</td>
</tr>
<tr>
<td>The unit will kick off with a scavenger hunt! Partners will search for passages located in available textbooks or classroom collections that represent descriptions of each type of text structure without being told the name of the described structure. They will use sticky notes to flag examples found and will choose one to share with the class whole group.</td>
</tr>
<tr>
<td><strong>What events will help students experience and explore the big idea and questions in the unit? How will you equip them with needed skills and knowledge?</strong></td>
</tr>
</tbody>
</table>
| Following the scavenger hunt activity from the first day of our unit, teams will revisit the passages they found. Given a list of the four organizational patterns, teams will be tasked with matching them with their passages/descriptions.  
*For example: Find 2 or more people, places, or things that are being compared.  
*Find a character or characters that have a problem and need a solution.  

This activity will be followed with team discussions about reasons why understanding how the author organizes a passage is beneficial to reading. |
comprehension (helps students monitor their comprehension).

Next, we will display and discuss the introductory slide for the Text Structure PowerPoint that will be used throughout our unit. Students will spend a few minutes independently reflecting about the term, “text structure,” with the goal of determining its meaning based on prior knowledge and experience from the scavenger hunt activities.

The remainder of the PowerPoint will be presented and each slide discussed. Students will receive a copy of this PowerPoint. Students will cut each slide out and paste in their ELA notebooks to use for reference. Each slide includes the organizational pattern along with its definition and an example in the form of a graphic organizer. This will be a great study/reference resource.

***Add more specifics on the PPT (what information it includes.***

<table>
<thead>
<tr>
<th><strong>How will you cause students to reflect and rethink? How will you guide them in rehearsing, revising, and refining their work?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I will use my document camera to project 5-10 separate short texts (one at a time) that will portray the organizational patterns. First we will give students a Compare and Contrast text, and they will paste in their ELA notebooks. Students will be told that they have to read this passage at least 2 times and be thinking about what type of pattern the author used. They will not be told it is cause and effect. Once students have had the opportunity to read it, I will read it aloud to the class. I will ask students to respond to this text by stating which pattern they believe its written in. Once I’ve heard feedback I will say: Let’s analyze this text. Do we notice any signal words that gave you the indication it is what you say it is. We will highlight or circle these signal words as a class such as: Both, Also, and, however, on the other hand, while. Once we’ve established the text is Compare &amp; Contrast and students have recorded, a second passage will be distributed (chronological). Will report the same steps as we did with the first text.</strong></td>
</tr>
</tbody>
</table>

Once I have modeled all 4 pattern types. I will give
students another text, which they must analyze without me modeling. I will walk around and assist/encourage any student that seems to be struggling. I will ensure that each student is reading thoroughly and that he/she is identifying signal words. Each student must record under the text the pattern they believe it is and why. They must write for example: The text structure is chronological. I know this because..... Each student must be able to explain their answer and not just guess. Students will be given another short text and will have to do the same process as above. Students are encouraged to use their PowerPoint notes.

How will you help students to exhibit and self-evaluate their growing skills, knowledge, and understanding throughout the unit?

Students will be given the opportunity to collaborate in teams/small groups in order to show understanding of text structure. Teams will be given 4 passages. They must read each passage aloud (taking turns with each passage) and use their learned skills/notes to identify the pattern of the text. If team members disagree that are encouraged to talk with teacher for guidance. Each team will be given different passages. Once all groups have identified each text, I will collect the work and each group with get another groups work. They must review it and see if they agree or disagree. This will provide lots of discussion and generate text curiosity. Students will be given homework assignments that will provide practice and will build vocabulary.

How will you tailor and otherwise personalize the learning plan to optimize the engagement and effectiveness of ALL students, without compromising the goals of the unit?

Students will
*Work in teams to create a chronological map depicting “How a Bill Becomes a Law”
*Create a problem/solution writing piece about Native Americans using the social studies book as a reference.
*Create a writing piece on “The Lost Colony” in the cause and effect format.
*Create a writing piece comparing the state government to the national government (or state to local, refer to S.S. textbook Ch. 9).
*Write a paragraph that demonstrates a specific organizational pattern (e.g., a student could create a paragraph that is organized by cause and effect). Paragraphs will be traded among peers for analysis.
| How will you organize and sequence the learning activities to optimize the engagement and achievement of ALL students? | Instructional routines will follow the general pattern of: teacher/student modeling, guided practice, collaborative practice, and independent practice.  

Text structure patterns will be presented from least to most complex. Previously read texts will be used when introducing each type of organization pattern. Students will revisit familiar texts for the purpose of identifying text structure.  

Frequent formative assessments will be used throughout the unit to gauge students’ progress toward mastering learning objectives. These assessments will be evaluated (e.g., grades may be placed on formative assessments, but they will not be recorded in the grade book). Students can use feedback from formative assessments to self-assess progress, and teachers can use the results to adjust instruction as needed.  

Differentiated choice boards will be provided for all students. Activities on choice boards may be differentiated according to task difficulty, learning style, and/or individual interests and will depend on the needs of student groups. Rubrics will be provided with choice boards to guide students’ work and for self-assessment. |
Appendix C

Interactive Reading Notebooks
**Figure C1.** Example from Interactive Reading Notebook

**Before Reading**
- Preview
  1. Read the title
  2. skim the text
  3. visualize
  4. look at pictures
  5. try to decide if it is fiction or informational

* Why do we need to PREVIEW?

**Figure C2.** Interactive Notebook Entry

- Way of retelling a story in your own words
- done during and after reading
- While reading, **chunk** the text
- Stop and summarize
<table>
<thead>
<tr>
<th>How to Chunk</th>
<th>Why to Chunk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) words -</td>
<td>1) words -</td>
</tr>
<tr>
<td>2) texts -</td>
<td>2) texts -</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>When to Chunk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) words -</td>
</tr>
<tr>
<td>2) texts -</td>
</tr>
</tbody>
</table>

*Figure C3. Interactive Reading Notebook Sample: Reading Strategies (Chunking)*
Figure C4. Example of strategy integration in Social Studies
Figure C5. Passage and sample questions used when introducing the use of confidence judgments.
Figure C6. Example activity and notebook entry from informational text structures unit
Appendix D

Reading Strategies Chart
<table>
<thead>
<tr>
<th>Strategy</th>
<th>How to use?</th>
<th>When to use?</th>
<th>Why to use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction</td>
<td>Give a good guess of what is going to happen next.</td>
<td>When your reading and want to know what is happening next.</td>
<td>To become a better reader.</td>
</tr>
<tr>
<td>Connections</td>
<td>When you relate one text to another or to a known passage</td>
<td>To understand text that are better related in at least a way.</td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>To check that while reading you understand the text.</td>
<td>To be able to understand confusing text.</td>
<td></td>
</tr>
<tr>
<td>Summarization</td>
<td>Tell what the story is about in a few sentences.</td>
<td>After reading a text.</td>
<td>To be a better reader and understand the text.</td>
</tr>
<tr>
<td>Imagery</td>
<td>To picture something from the text info.</td>
<td>While reading to help you picture what is going on in the story.</td>
<td></td>
</tr>
<tr>
<td>Infer</td>
<td>Figure out info. that is not given</td>
<td>While answering questions to figure out info. that is not given.</td>
<td></td>
</tr>
<tr>
<td>Self-Assess</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>