

# Effects of an Informational Text Reading Comprehension Intervention for Fifth-Grade Students

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## Abstract

Upper elementary school students who have reading problems may have difficulty in one or more areas of reading, each requiring specific types of interventions. This study evaluated a short-term reading intervention for 46 fifth-grade students with poor reading comprehension. Students were randomly assigned to an intervention or no treatment control condition. The 40 session (20 hr) intervention targeted reading comprehension strategy instruction in the context of informational science texts. Analyses showed statistically significant effects favoring the intervention on two proximal measures (i.e., measures closely related to the intervention content). The effects for the outcomes were moderate ( $g_s = 0.61$  and  $0.72$ ). There were no statistically significant differences on distal measures (i.e., measures less closely aligned with the intervention). The findings provide support for the efficacy of a reading comprehension intervention that may inform short-term interventions within a Response to Intervention framework.

## Keywords

reading comprehension, comprehension difficulties

Reading comprehension is necessary for academic success. Yet, on the National Assessment of Educational Progress, 65% of fourth graders scored below proficient in reading. In addition, the stakes are increasing as the Common Core State Standards (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) and related assessments are adopted across the United States. For college and career readiness, fourth and fifth graders are expected to be able to read and comprehend a range of texts, including informational texts across content areas independently and proficiently. However, the question remains, how should schools address the comprehension-related needs of struggling students? One model implemented in a number of schools across the country to address reading problems is Response to Intervention (RTI). Within this model, students who are struggling receive increasingly intensive intervention as needed to improve their reading skills. Although RTI has been used more widely in the early grades to address decoding and reading fluency needs, providing intervention for reading comprehension may be needed for many students whose difficulties are primarily with understanding what they read. Such intervention may be especially important in the upper elementary grades when the focus of instruction is on learning from content area texts. However, there are few validated interventions that can be used within an RTI framework for

the purposes of supporting reading comprehension in upper elementary school. Thus, we implemented a study of a reading-comprehension intervention using informational science texts for fifth graders that could be used in an RTI model.

## Identification of Upper Elementary Students With Comprehension Difficulties

Universal screening and early intervention in beginning elementary school years are often focused on decoding and fluency problems, but many children emerge as poor readers in the later elementary school years with reading comprehension difficulties that were previously unnoticed and untreated (Archer, Gleason, & Vachon, 2003; Catts, Compton, Tomblin, & Bridges, 2012). Emerging evidence

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suggests that some students have late emerging reading difficulties and that students may have different profiles of reading problems in fourth and fifth grades (Catts et al., 2012; Compton, Fuchs, Fuchs, Elleman, & Gilbert, 2008; Leach, Scarborough, & Rescorla, 2003; Lipka, Lesaux, & Siegel, 2006; Speece et al., 2010). For example, of 63 fourth-grade students identified by Speece et al. (2010) as having reading difficulties, 46% students had problems in decoding *or* fluency, 19% students had problems in reading comprehension, 13% students had problems in reading comprehension and in decoding *or* fluency, and 22% students had problems in reading comprehension, decoding, *and* fluency. In a similar analysis, Leach et al. (2003) identified 116 fourth- and fifth-grade students with late emerging reading problems. Of the sample, 7% students had problems in reading comprehension, 17% students had problems in decoding, and 16% students had problems in both reading comprehension *and* decoding. Considering that both studies identified different profiles of students with reading difficulties, it may be that intervention needs to be tailored to these profiles. Although there are numerous interventions targeting decoding and fluency, there are fewer interventions targeting reading comprehension. Given that Speece et al. (2010) and Leach et al. (2003) identified a specific group of students with comprehension-specific problems, the present study aimed to evaluate the effects of a comprehension-specific intervention that could address research findings of varied reading profiles. Such intervention is needed to appropriately meet the needs of students with comprehension-specific problems in upper elementary grades.

### **Intervention for Comprehension Difficulties in Upper Elementary School**

Recent reviews of research on reading comprehension interventions for upper elementary and adolescent students with or at risk of reading disabilities have identified key features of effective instruction (see Edmonds et al., 2009; Gajria, Jitendra, Sood, & Sacks, 2007; Gersten, Fuchs, Williams, & Baker, 2001; Kamil, 2003; Scammacca et al., 2007; Wanzek, Wexler, Vaughn, & Ciullo, 2010). First, explicit instruction, including teacher modeling, in reading strategies that can be used before, during, and after reading has been found to be effective. Reading comprehension interventions that provided explicit instruction in reading comprehension strategies such as main idea identification (e.g., Graves, 1986; Jitendra, Hoppes, & Xin, 2000), summarization (e.g., Gajria & Salvia, 1992; Malone & Mastropieri, 1992; Nelson, Smith, & Dodd, 1992), and question answering strategies such as Question–Answer Relationships (QAR; Graham & Wong, 1993; Raphael & Au, 2005) have yielded positive outcomes. Most studies on

explicit strategy instruction report moderate to large effects on proximal (i.e., intervention-aligned) measures of reading comprehension (Edmonds et al., 2009; Scammacca et al., 2007; Wanzek et al., 2010).

Two other components of evidence-based reading comprehension instruction include attention to self-regulation and peer collaboration. Reading comprehension interventions that include attention to self-regulation and self-questioning have been linked to moderate to large gains in comprehension (Johnson, Graham, & Harris, 1997; Malone & Mastropieri, 1992; Mason, 2004; Wanzek et al., 2010; Wong & Jones, 1982). Interventions that include opportunities for peer-mediated practice using appropriate texts have resulted in gains in reading comprehension, especially for older students. Several studies have used reciprocal teaching (e.g., Bruce & Chan, 1991; Lederer, 2000) or programs that evolved from reciprocal teaching, such as Collaborative Strategic Reading (Klingner, Vaughn, & Schumm, 1998) to increase peer interaction. These approaches have yielded positive outcomes for reading comprehension for fourth- and fifth-grade students.

Recently, researchers have begun developing and evaluating interventions to use within the RTI framework. Changes to the Individuals With Disabilities Education Improvement Act (IDEA; 2004) permit a process that allows school-based teams to identify a student as a *student with learning disability (LD)* based on a lack of response to classroom instruction. In RTI models, students who are identified as at risk (often through a universal screening process) for reading problems are provided with interventions as part of the identification process. Interventions are typically delivered in a tiered system. For example, students who are not making progress in Tier 1 (i.e., regular evidence-based instruction) receive supplemental Tier 2 intervention, and students who fail to respond to Tier 2 intervention are provided with more intensive Tier 3 intervention.

Research on interventions that could be used in an RTI framework in early elementary school (i.e., kindergarten to third grades) has shown positive effects, particularly in decoding and fluency (e.g., Denton, Fletcher, Anthony, & Francis, 2006; Vaughn, Linan-Thompson, & Hickman, 2003). There is much less research on interventions that could be used in an RTI framework in upper elementary school (i.e., fourth and fifth grades). The nascent body of research using RTI with older students with reading problems has shown mixed results. For example, Vaughn et al. (2010) provided struggling middle school students with supplemental intervention daily for an entire school year. The intervention included word reading, fluency, vocabulary, and reading comprehension instruction, and the comparison condition included professional development for teachers to enhance their classroom instruction. Results showed gains in reading outcomes for both groups, and

reported small differences favoring the intervention condition on word attack, spelling, phonemic decoding, and reading comprehension.

In another study of a supplemental intervention, Faggella-Luby and Wardwell (2011) investigated a reading comprehension intervention for fifth- and sixth-grade students focused on narrative text. Students identified as poor readers were assigned to one of three intervention conditions: (a) story structure instruction, (b) sustained silent reading, or (c) typical intervention provided by a reading specialist. Students participated in the intervention for two to three 30-min sessions each week for 18 weeks. The authors reported mixed results, but significant effects for maze, which indexes fluency and reading comprehension. Effects showed that students in the story structure and sustained silent reading conditions outperformed students in the typical intervention condition on maze.

Finally, Graves, Duesbery, Pyle, Brandon, and McIntosh (2011) developed a supplemental intervention program that was reported in two studies for sixth-grade students, many of whom were English learners and were reading approximately 3 years below grade level. Students in the intervention group received 30 hr of intervention in word analysis, fluency, vocabulary, and reading comprehension. In the first study, the authors found significant effects favoring the intervention condition for oral reading fluency but no effects for vocabulary or maze. In the second study, an additional reading comprehension measure was included. In this analysis, the authors reported significant effects favoring the intervention condition for oral reading fluency and passage comprehension (but not vocabulary or maze).

Although these studies provide an indication that interventions implemented within an RTI framework can be effective in improving reading for older students, there is a need for much more research in this area. Specifically, because RTI is used both to identify students who are struggling and to provide appropriate intervention to those students, intervention within an RTI framework has been conceptualized as short-term (e.g., 12–16 weeks; Gersten et al., 2008; Mellard, McKnight, & Jordan, 2010). Interventions such as the one implemented by Vaughn et al. (2010) would not qualify as short-term as the instructional time was approximately 100 hr. In addition, there is some indication that targeted interventions rather than multi-component interventions such as those implemented by Vaughn et al. (2010) and Graves et al. (2011) may best serve students with different profiles of reading problems (Gersten et al., 2008). Finally, given that informational and content area text are particularly problematic for students with reading difficulties in upper elementary school, interventions targeting informational rather than narrative text as in the Faggella-Luby and Wardwell (2011) study are needed (Englert & Thomas, 1987; Wong & Wilson, 1984). Thus,

research on short-term interventions to meet the needs of students with difficulties in specific areas in upper elementary school is needed.

## Purpose and Research Question

The purpose of the current study was to investigate the effectiveness of a short-term informational text reading comprehension intervention (20 hr) for fifth-grade students with comprehension difficulties. We focused on informational text comprehension given the difficulties encountered by students with reading disabilities in understanding informational text (Englert & Thomas, 1987; Wong & Wilson, 1984) and the importance of informational text for academic success as students get older (Grigg, Daane, Jin, & Campbell, 2003). Our research question was the following:

What are the effects of a short-term intervention focused on reading comprehension of informational text for fifth-grade students with comprehension difficulties?

## Method

### Participants

The participants were 46 fifth-grade students with reading comprehension difficulties. Prior to the beginning of the school year, fifth-grade teachers and the school principal within each school identified a group of students who had potential difficulty in reading comprehension, and these students ( $N = 100$ ) were invited to participate. We screened 70 fifth-grade students who had parental consent and who also provided their assent. The screening measures (described in detail below) were Passage Reading Fluency (L. S. Fuchs, Hamlett, & Fuchs, 1990) and the Test of Silent Reading Efficiency and Comprehension (TOSREC; Wagner, Torgesen, Rashotte, & Pearson, 2010). We were interested in selecting students with poor reading comprehension. We selected students for participation in the intervention study who scored below the 30th percentile on TOSREC as this cut point indicates some risk of reading comprehension problems. Two students who had very low fluency scores on Passage Reading Fluency ( $<40$  wpm) were not selected as this intervention would not address significant decoding or fluency needs.

Students ( $N = 48$ ) were randomly assigned to intervention or a no-treatment control condition. One student moved out of the school during the intervention (from the control group), and one student withdrew (from the intervention group) making the final sample 46 students ( $n = 23$  per condition). The mean age of participants was 10 years 7 months ( $SD = 0.39$  months). Demographic information for the screening sample, the intervention group, and the control

**Table 1.** Participant Demographics.

Demographic variable	Screening		Intervention		Control	
	N	%	N	%	N	%
<b>Gender</b>						
Male	36	48.6	11	47.8	11	47.8
Female	34	51.4	12	52.2	12	52.2
<b>Race</b>						
African American/Black	17	24.3	3	13.0	7	30.4
Asian American	3	4.3	0	0	1	4.3
Caucasian	36	51.4	15	65.2	13	56.5
Biracial	9	12.9	5	21.7	0	0
Prefer not to answer	5	7.1	0	0	2	8.7
<b>Mother's education</b>						
<High school graduate	1	1.4	1	4.3	0	0
High school graduate	5	7.1	2	8.7	1	4.3
Some college	15	21.4	4	17.4	3	13.0
College graduate	27	38.6	8	38.1	13	56.5
Some graduate school	13	18.6	5	21.7	3	13.0
Graduate degree	8	11.4	3	13.0	3	13.0
Prefer not to answer	1	1.4	0	0	0	0
<b>Special education</b>						
Yes	—	—	3	13.0	2	8.7
No	—	—	20	87.0	21	91.3
<b>English language learner</b>						
Yes	—	—	1	4.3	2	8.7
No	—	—	22	95.7	21	91.3

Note. Special Education status includes students with either an Individualized Education Plan or a Section 504 Plan.

group are found in Table 1. Three students had Individualized Educational Plans, and two students had a Section 504 Plan. Both students were identified by the school-based special education team at their school following statewide procedures for special education eligibility. Of the students with identified disabilities, one student was identified with LD in math (receiving 300 min of specialized instruction per week), one student was identified with LD in written language (receiving 150 min of specialized instruction per week), and one student was identified with LD but did not receive additional specialized instruction outside the general education instruction. Four students were English Language Learners; three of these students were provided with English language instruction.

### *Instructional Setting*

Students attended one of four K-5 elementary schools within a medium-sized, public school district in the Mid-Atlantic region of the United States. This school district serves approximately 75,000 students. At the elementary school level, 27.8% of students are eligible to receive free and reduced meals, 32.7% of students have limited English proficiency (LEP), and 24.3% of students receive special education services.

The school district adopted the *Treasures* (McGraw-Hill, 2011) program as the core literacy curriculum for all elementary schools. This curriculum is described as a research-based comprehensive reading and language arts curriculum, and it includes a literature-based student anthology. Each school also was provided with an approved set of supplemental reading interventions for students needing additional instruction beyond the general reading curriculum. These included *Soar to Success* (Cooper, Boschken, McWilliams, & Pistochini, 2006), *Voyager Expanded Learning* (2004), and the *Corrective Reading Program* (SRA/McGraw-Hill, 2008). Teachers and/or reading specialists selected the intervention program they felt would meet each student's instructional needs. In the participating schools, students who were participants in the study continued to receive services deemed necessary by school staff. We asked school staff to provide information on the type of supplemental reading instruction and the scheduled amount of instructional time per week for students in the intervention and control conditions. In the intervention group, two students received instruction (150 min per week) using *Voyager*. In the control group, nine students received intervention (four students were provided with *Corrective Reading* for 180–200 min per week, four students were provided with *Voyager* for 150–180 min per week, and one

student was provided with *Soar to Success* for 175 min per week).

### Measures

**Passage reading fluency.** Passage Reading Fluency (L. S. Fuchs et al., 1990) is a measure of oral reading fluency. Students read aloud two narrative passages for 1 min each. Two fifth-grade-level passages were administered, and we used the mean score (correct words per minute) in analyses. Passage Reading Fluency has strong criterion validity and reliability, which averages .90 across studies (L. S. Fuchs & Fuchs, 1992).

**Test of Sentence Reading Efficiency and Comprehension.** The Test of Sentence Reading Efficiency and Comprehension (TOSREC; Wagner et al., 2010) is a norm-referenced assessment of students' ability to comprehend silently read sentences. Students read a set of grade-level sentences and indicate whether the sentence is true (by circling yes) or false (by circling no) and have 3 min to respond to as many sentences as possible. The authors report that reliability coefficients exceed .70 and alternate-form reliability coefficients exceed .85 across all forms and grade levels. Validity estimates for students in fifth grade were reported as very large ( $r_s = .73-.86$ ). Form A was administered at pre-test, and Form B was administered at post-test.

**WIAT Reading Comprehension.** The Reading Comprehension subtest of the Wechsler Individual Achievement Test, Third Edition (WIAT-III; Psychological Corporation, 2009) was administered to students. This untimed task consists of reading passages of increasing difficulty and answering questions orally after each passage. Questions on this measure require both explicit recall and inferential responses. The authors report the reliability coefficient for 10-year-olds for the Reading Comprehension subtest as .89 (Breux, 2009). The authors described evidence supporting adequate content and construct validity with other academic measures.

**ASKIT Comprehension Strategy Use and Knowledge.** To assess students' knowledge of and ability to use reading comprehension strategies for informational text, we administered the Assessment of Strategy Knowledge and Use for Information Text (ASKIT; Ritchey, Speece, Silverman, & Montanaro, n.d.). In this researcher-developed assessment, students are asked to answer 16 questions about reading strategies and to demonstrate these reading strategies while reading a short information text (O'Sullivan, 2003). Seven questions ask students to respond to questions that assess strategy knowledge (e.g., explain how to use a fix up strategy for a difficult word) or text features. Nine questions ask students to read text from the book and then to retell, identify the main idea and supporting details, or summarize the text. Students read the text

orally, and miscues are recorded. Students respond to each question orally, and responses are audio-recorded and transcribed verbatim for scoring. Responses are scored on a scale of 0 to 3, using a detailed scoring rubric for each question. Two scorers evaluated all items, and interrater agreement exceeded 90%; scorers discussed all discrepancies to yield a final score. The measure yields a raw score for reading comprehension, and analyses were conducted with this score. Cronbach's alpha for this sample ranged from .57 to .64 ( $n = 46$ ). This range is within the recommended .60 for researcher-developed measures (Gersten, Fuchs, Compton, Coyne, Greenwood, & Innocenti, 2005) and should be interpreted in light of a restricted sample.

**Qualitative Reading Inventory—Fifth Edition.** The Qualitative Reading Inventory—Fifth Edition (QRI-5; Leslie & Caldwell, 2011) is an informal reading inventory. Two informational passages at the third- and fourth-grade levels and the accompanying questions, which include both explicit/recall and inferential questions, were selected. We hypothesized that these levels would be within the students' instructional levels. At the third-grade level, three of the seven QRI passages are informational passages. At the fourth-grade level, two of the six QRI passages are informational passages. One third-grade and one fourth-grade passage and the accompanying questions were randomly selected for the pre- and post-test. The authors reported alternate-form reliability of .80 for text of the same genre and readability level.

For this assessment, students were asked to read each passage orally and miscues were recorded, but reading was untimed. Questions were then read to the students, and students provided oral responses. The students' verbatim responses were recorded by the examiner and verified with an audio recording. The number of comprehension questions answered correctly for both passages was summed (possible range = 0–16) and used in analyses. To assist in scoring, an expanded scoring guide was developed to elaborate correct and incorrect responses. Two scorers evaluated all items and interrater agreement exceeded 90%; the scorers discussed all discrepancies to yield a final score.

### Procedures

**Assignment to condition and testing pre-intervention group differences.** After selecting students who met the inclusion criteria, students' scores on TOSREC were rank-ordered and students were randomly assigned to the following conditions: intervention or a no treatment, or business as usual control condition. Students were selected across classrooms within each school. Differences between students in the intervention and control conditions were tested prior to the intervention using ANOVA for continuous variables and chi-square analysis for categorical variables. We found no

group differences on demographic variables, such as age,  $F(1, 44) = .00, p = .974$ ; English language learner status,  $\chi^2(df = 1, N = 46) = 1.10, p = .295$ ; Fisher Exact Test,  $p = .608$ ; mother's education,  $\chi^2(df = 5, N = 46) = 3.17, p = .674$ ; or gender,  $\chi^2(df = 1, N = 46) = 0.00, p = .999$ . There was a significant difference between groups for race,  $\chi^2(df = 4, N = 46) = 9.74, p = .045$ . The distribution of race categories was similar for White and Asian categories. However, in the control group, more students had their race reported as Black ( $n = 7$ ) than in the intervention group ( $n = 3$ ). More students had their race reported as Biracial in the intervention ( $n = 5$ ), but no students had their race reported as Biracial in the control group. We also tested group differences for screening variables, and there were no significant group differences on either Passage Reading Fluency,  $F(1, 44) = .001, p = .951$ , or TOSREC,  $F(1, 44) = .05, p = .834$ .

**Data collection procedures.** Students were screened in September (one session). Measures were administered at pre-test (one session in October) and post-test (two sessions in February) by one of seven graduate research assistants. All graduate research assistants were extensively trained, and they met standards for accurate administration and scoring of all measures prior to data collection. For screening and pre-test data collection, assessments were conducted by any of the graduate research assistants. For the post-test, assessments were not conducted by an individual who served as the student's tutor.

**Intervention.** The intervention was implemented from October to early February. The control group did not receive any additional intervention beyond services provided by the school. Instruction was provided as supplemental instruction and generally scheduled during school-wide intervention times established by school administrators. There were seven small groups of two to four students. Groups met for forty 30 min sessions, 4 times per week over 10 to 12 weeks (20 hr of instruction). Students, on average, attended 36.30 ( $SD = 2.91$ ) sessions.

**Tutors.** Each group was taught by one of three graduate research assistants. All tutors were certified teachers and had extensive teaching experience. Two tutors held master's degrees, and one had bachelor's plus additional graduate credits; all tutors were enrolled in masters- or doctoral-level programs in education. Tutors participated in approximately 20 hr of training.

**Intervention components.** We targeted informational text and included a multiple component strategy for before, during, and after reading using science texts. Using the existing state curriculum standards for reading/language arts and science, we developed an intervention thematically organized around life in or around the ocean (see Figure 1). Reading

comprehension instruction included explicit instruction and scaffolded practice for (a) previewing texts, (b) activating background knowledge, (c) using strategies to decode and understand unfamiliar words, (d) identifying the main idea by "shrinking" the paragraph (D. Fuchs, Fuchs, Mathes, & Simmons, 1997; Jenkins, Heliotis, Stein, & Haynes, 1987), (e) summarizing, and (f) using an adaptation of the QAR strategy (Graham & Wong, 1993; Raphael & Au, 2005) to generate and answer questions. Aspects that focused on understanding informational text were included (e.g., previewing strategies such as reading chapter titles, headings, and bold words and thinking about what may be known about the topic and main idea strategies for informational text). An acronym, PLUG IN, was used to help students remember the name and steps of the strategy (see Figure 1). PLUG IN corresponds to the strategies taught: Previewing, Linking to what you know, Using fix-up strategies, Generating questions, In your own words (main idea, summarizing), and Now, answer the questions.

The intervention followed a specific sequence of instruction in 4-day instructional cycles (see Figure 2). Day 1 consisted of explicit instruction of the targeted strategy and tutor modeling within short passages or selections of text that were closely aligned to the strategy. Day 2 consisted of additional modeling with greater emphasis on supported and independent practice within both short texts and trade books. For Days 1 and 2, the lesson plans included specific language for tutors to use for modeling reading comprehension strategies, introducing vocabulary, and asking text-based questions. Furthermore, students were provided multiple opportunities to practice newly introduced strategies. On Day 3, students independently practiced strategy application using trade books. Across all sessions, students practiced applying reading comprehension strategies with scaffolding from the tutor, and standardized instructional protocols included prompts to assist students with practice. Instructional activities were oral, although students may have written brief phrases or sentences as part of lessons (e.g., write questions while previewing). The trade books were selected for both topic and interest. The Lexile levels of the books ranged from 580 to 1,070; texts or sections of text were selected to match students' reading levels.

Day 4 followed an instructional procedure that was modified from Collaborative Strategic Reading (Klingner et al., 1998). Students guided one another, rotating as the "coach," on strategic use and application of the reading comprehension strategies within a biographical text about an individual associated with oceans. The student acting as the coach during these sessions prompted peers to apply reading comprehension strategies with a set of procedures and questions related to the specific strategy (provided on a cue chart on a coach's lanyard). For example, to prompt peers to link the text to something they already know, the coach might ask, "What does this text remind you of?"

Step	Strategy	Brief Description
P	Previewing and using text features ( <i>Making predictions and generating questions</i> )	Students preview the text, focusing on heading/ subheadings, bold words, pictures, and other expository text features. They make predictions about what they might learn from the text and generate questions.
L	Link to what you know <i>Making connections</i>	Students make connections between what they read and their knowledge, experiences, and other texts.
U	Use fix up strategies (a) <i>decoding/word reading or</i> (b) <i>vocabulary/meaning</i>	Students identify words, phrases, or text they do not understand, and evaluate whether the misunderstanding was about how to read the text (decoding), what the text means or both. They learn to use a series of fix up strategies.
G	Generating questions	Students generate questions before and during reading.
I	In your own words <i>Main idea</i>	Students identify the topic (the “who” or the “what”) and the most important information in the text about the topic. Main idea instruction targets identifying the main ideas in pictures, sentences, and passages. Summarization instruction focuses on longer sections of text (multiple paragraphs, chapters).
	In your own words <i>Summary</i>	
N	Now, answer the questions	Students answer questions by identifying whether the answer is <i>Here</i> (in the text), <i>Hidden</i> (in the text, but hidden), <i>In My Head</i> (not in the text), or the reader should be <i>On the Hunt</i> (not in the text, but could be answered using other resources). We added the <i>On the Hunt</i> component to Graham & Wong’s (1993) 3H strategy.

**Figure 1.** Components of the comprehension strategy.

This aspect of the intervention also gave students opportunities to take ownership of learned reading comprehension strategies and evaluate their peers’ application in text. In addition, we included several hands-on science activities (e.g., an activity with fossilized shark teeth, an investigation that simulates the effects of whale blubber) throughout the intervention as another way to maintain student interest.

**Fidelity of intervention implementation.** We created a rubric to evaluate fidelity of intervention implementation focusing on adherence to lesson plan structures, lesson duration, and quality of instruction. The 32-point rubric included criteria regarding explicit strategy instruction, effective teaching practices, and integration of the strategies in reading practice. The rubric rated criteria including (a) the presence or absence of certain instructional components, (b) the instructional quality of modeling and feedback, (c) the duration of instruction on specific components and the overall session, and (d) type of student reading activities. We evaluated tutor fidelity in three ways. Prior to the start of intervention, tutors demonstrated their ability to implement randomly selected lessons with at least 90% fidelity. Also, the second author observed lesson implementation and provided feedback to tutors as necessary.

In addition, all lessons were audio-recorded, and we evaluated approximately 10% of lessons ( $n = 28$ )

randomly selected across tutors and intervention groups for fidelity of implementation. Mean fidelity of intervention implementation for all components was 90% ( $SD = 5\%$ ). To ensure all intervention groups received the allotted amount of instruction time, we analyzed lesson duration. The mean lesson duration was 31 min 18 s ( $SD = 1$  min 20 s).

## Results

Table 2 includes descriptive statistics for all measures. Standard scores for norm-referenced measures are reported in Table 2, but raw scores were used in all analyses.

### Differences on Pre–Post Measures

Differences between the intervention and control conditions (group) were investigated through ANOVA and ANCOVA using pre-test scores as the covariate (Petscher & Schatschneider, 2011; Shadish, Cook, & Campbell, 2002). Students in intervention and comparison conditions were drawn across classrooms within each school; thus, students were not nested within classroom teacher for analyses. Given the small sample size, we were interested in the effect sizes associated with group differences and we interpreted the magnitude of the effect sizes according to Cohen (1988). Effect sizes were calculated using Hedge’s  $g$ , with covariate-adjusted mean scores.

Day 1	Day 2	Day 3	Day 4
<u>Focus</u> - Explicit instruction of the targeted strategy	<u>Focus</u> - Review/reteach and scaffolded practice of the targeted strategy	<u>Focus</u> - Scaffolded and independent practice of the targeted strategy	<u>Focus</u> - Application of the targeted strategy using a collaborative reading approach and a biographical text
<b>Components of Each Lesson</b>			
Introduction: Introduction to the session and review of prior session			
<p><u>Strategy Instruction</u> Tutor describes targeted strategy using a visual chart with the name and steps/components of the strategy.</p> <p>Tutor explains purpose of the strategy and when/how it can be used while reading</p> <p>Tutor models the strategy using think aloud and text examples.</p>	<p><u>Strategy Instruction</u> Tutor reviews the name, steps and purpose of the strategy by having students state and explain the strategy; re-teaching as needed.</p> <p>If the students need additional instruction, the tutor either reteaches the entire strategy, or the missing steps.</p>	<p><u>Strategy Instruction</u> Tutor briefly reviews the name, steps, and purpose of the strategy.</p> <p><u>Re-teaching</u> Tutor briefly models the steps of the targeted strategy using think aloud, if needed.</p>	<p><u>Strategy Review</u> Tutor reviews the name, steps, and purpose of the strategy by having students state and explain the strategy.</p> <p><u>Assignment of Roles</u> Tutor introduces and reviews the role of “coach” and role of group members.</p> <p>A cue card with the coaching language is added to the coach’s lanyard.</p>
<p><u>Practice</u> Students practice using the strategy with support, using specific passages and text examples aligned to the strategy.</p>	<p><u>Practice</u> Students practice using the targeted strategy with support in trade books.</p>	<p><u>Practice</u> Students practice using the targeted strategy with support or independently in trade books. If needed, the tutor uses prompts to assist students.</p>	<p>Tutor models coaching language, as needed and assigns the coach role.</p> <p><u>Preview of Biography Text</u> Coach guides the introduction and preview of the text.</p> <p><u>Collaborative Reading</u> Students read the biographical text using collaborative strategies, taking turns to read selected text.</p>
<p><u>Strategy Integration</u> Students and tutor read sections of trade books (tutor reads orally to students and students read orally and/or silently) and students practice using the targeted strategy and any previously learned strategies with teacher support.</p> <p>Tutor models (using a think aloud) how to use of all steps of PLUG IN using text examples.</p>			<p>Coach prompts group members to use strategies.</p> <p>Tutor interjects to provide support as needed.</p>
<u>Closing</u> - Summary and review of the session, and preview of next session			

**Figure 2.** Lesson structure.

Table 3 presents the group differences for the ANOVA and ANCOVA models. There were significant differences favoring the intervention group for ASKIT; the effect size was 0.724. There were also significant differences favoring the intervention group for QRI Comprehension ( $g = 0.611$ ). These effect sizes are interpreted as moderate.

There were also no significant group differences on TOSREC, WIAT Reading Comprehension, or Passage Reading Fluency. For WIAT Reading Comprehension, the effect size was  $-0.037$ , and for TOSREC, the effect size was 0.155. There was a small, negative effect size (favoring the control group) for Passage Reading Fluency ( $g = -0.105$ ).

**Discussion**

The purpose of this study was to investigate the effectiveness of a short-term reading comprehension intervention for struggling upper elementary grade students that could be used within an RTI model. The intervention focused on

reading comprehension strategy instruction in the context of informational science texts, which are important for academic success and difficult for many struggling readers. The intervention combined explicit instruction, practice in authentic texts such as trade books, and peer interaction into a single intervention package. Explicit instruction provided students with clear directions for how to implement strategies. Practice in authentic texts supported students in developing skills that they could generalize outside the intervention. In addition, peer collaboration was provided meaningful opportunities to practice specific reading comprehension strategies with support (Kamil, 2003; Klingner et al., 1998).

As might be expected, we found significant effects for measures most closely related to the intervention content, which suggests that as a group, the students learned the targeted strategies. After 20 hr of instruction, there were statistically significant differences between students in the intervention condition and control condition for two



**Table 2.** Descriptive Statistics.

Measure	Intervention		Control		Screening	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Assessment of Knowledge and Strategy Use for Information Text						
Pre-test	24.86	6.07	23.13	5.35		
Post-test	28.91	4.90	25.13	4.14		
Passage Reading Fluency						
Screening	92.52	25.03	91.98	25.17	114.57	29.71
Post-test	93.52	25.03	95.74	25.06		
QRI Comprehension						
Pre-test	8.96	2.78	7.44	2.71		
Post-test	9.65	2.46	8.04	2.38		
TOSREC						
Screening	81.13	7.95	80.87	7.69	94.95	11.57
Post-test	84.04	10.48	82.48	9.44		
WIAT Reading Comprehension						
Pre-test	89.78	6.77	86.61	5.55		
Post-test	92.87	8.23	90.87	7.00		

Note. Grade-based standard scores are reported for TOSREC and WIAT Reading Comprehension. Screening sample includes students who were not selected to participate in the study. QRI = Qualitative Reading Inventory; TOSREC = Test of Silent Reading Efficiency and Comprehension; WIAT = Wechsler Individual Achievement Test.

**Table 3.** ANOVA/ANCOVA Results.

Measure	<i>F</i>	<i>p</i>	<i>g</i>
Assessment of Knowledge and Strategy Use for Information Text			
Group	5.645	.022	0.724
Pretest	8.253	.006	
Passage Reading Fluency			
Group	0.569	.455	-0.105
Pretest	167.736	<.0001	
QRI Comprehension			
Group	4.262	.045	0.611
Pretest	3.674	.062	
TOSREC			
Group	0.255	.616	0.155
Pretest	4.290	.044	
WIAT Reading Comprehension			
Group	0.019	.891	-0.037
Pretest	23.837	<.0001	

Note. *g* = effect size calculated using covariate-adjusted *M* and *SD* of control group; QRI = Qualitative Reading Inventory; TOSREC = Test of Silent Reading Efficiency and Comprehension; WIAT = Wechsler Individual Achievement Test.

reading comprehension outcomes. These measures could be considered proximal measures as they were closely related to instructional content. Proximal differences help to inform instruction and are more sensitive to how students respond

to instruction. As in other studies (Wanzek et al., 2010), we did not find evidence of effects on distal measures such as norm-referenced reading comprehension assessments. Of note, our findings are consistent with the mean effect size for researcher-developed assessments (about 1.0) and for norm-referenced assessments (about 0.30) found in other reading comprehension interventions research (Scammacca et al., 2007).

Small gains on norm-referenced comprehension outcomes are a common finding in intervention studies implemented in a RTI framework, especially for older students (Faggella-Luby & Wardwell, 2011; Graves et al., 2011; Vaughn et al., 2010). Comparisons across studies are difficult as the sample, reading intervention components, measures, and length of intervention vary. It may be that effects may be found only after extended implementation of these interventions. This intervention was relatively short, but within the same time frame as the studies by Graves et al. (2011) and Faggella-Luby and Wardwell (2011). It may take more instructional time for students to consolidate knowledge and use strategies effectively and that reading comprehension problems are difficult to ameliorate. It may also be that broad reading comprehension growth is more difficult to detect, and that solid improvement in one area of reading comprehension (e.g., finding the main idea of a paragraph in informational text) may not transfer to other aspects of reading comprehension (e.g., finding the main idea in narrative text). A final possibility is that existing

reading comprehension interventions lack either the components or intensity that is needed to improve reading comprehension for older students.

### *Implications for Reading-Comprehension-Tiered Interventions*

This study suggests several implications for using reading comprehension interventions for students in upper elementary grades as part of RTI. This intervention was provided for the recommended length of time (10–12 weeks), was taught in a small group format by a qualified instructor, and was designed to be supplemental. This intervention, as a specific multi-component reading comprehension intervention, holds promise for use as a Tier 2 or Tier 3 intervention for students with comprehension-specific reading problems. Students who received the intervention outperformed the control condition on two reading comprehension outcomes.

Statistical modeling of responders versus non-responders was not possible given the small size, but there was some differential response to the intervention as some students made more growth. We were interested in exploring how students responded to this intervention and whether it would be possible to predict which students would or would not be *responders*. One possibility is that response to a reading intervention could be related to a student's initial reading fluency abilities. In the intervention group, students' fluency scores at the beginning of the intervention ranged from approximately 50 to 170 wpm. Students with lower fluency scores (based on a median split) did not consistently respond in ways that were different from students with higher fluency scores. On average, students with lower fluency scores also had lower post-test scores for TOSREC and QRI, but not for post-test WIAT Reading Comprehension or ASKIT. This suggests that students' initial fluency skills may not be a good predictor of how a student would respond to a reading comprehension intervention or that this intervention may have influenced fluency as well. Additional research is needed to help to clarify the role of word reading and fluency abilities in reading comprehension interventions, especially for students in upper elementary grades.

Another way to identify which students responded or failed to respond would be to examine standard scores from a norm-referenced achievement test. These scores are often used as part of the evaluation process to identify a student as a student with LD. Of the students with a standard score below 90 at pre-test on WIAT Reading Comprehension, five students had post-test standard scores above 90. Standard score increases ranged from 3 to 19 points, suggesting strong response to instruction for several students. Seven students with pre-test standard scores below 90 also had post-test standard scores below 90, with a change in standard scores ranging from a decrease of 7 points to an

increase of 5 points. These students might be candidates for additional intervention or a more intensive intervention. Other students did not demonstrate as dramatic changes in WIAT Reading Comprehension standard scores.

Finally, it will be important to consider further appropriate ways to monitor responsiveness to instruction for short-term interventions in reading comprehension, especially when the intervention is focused on informational texts. In many studies of tiered interventions, the measures that are used for screening are also used for progress monitoring. In this study, we selected two validated screening measures (Passage Reading Fluency and TOSREC). However, these measures would not be useful for progress monitoring. Passage Reading Fluency probes do not focus on information text passages or provide a direct assessment of reading comprehension. TOSREC is not designed for progress monitoring across brief intervals (TOSREC has three alternate forms designed for fall, winter, and spring plus one additional alternate form). There are challenges in developing informational text progress-monitoring probes, including determining the text reading level, the informational text structure (e.g., sequence, cause/effect, compare/contrast), and the role of topical background knowledge in reading comprehension. As research in RTI as part of the identification process for students with LD in reading comprehension expands, it may be important to prioritize the development and validation of assessments that can be used to monitor progress. Likewise, student response to short-term interventions may be insufficient as a marker of LD until we know more about the intervention conditions that are sufficient to produce substantive changes in reading comprehension.

### *Limitations and Directions for Future Research*

There are several limitations requiring consideration in interpreting these results. The sample size is small in comparison with many studies of reading comprehension interventions. However, it is important to note that the available number of fifth-grade students with reading comprehension problems only is a subset of a much larger group of students with reading problems. In this study, we asked school staff to identify students as possible candidates who would benefit from a reading comprehension intervention, as opposed to intervention focused on word reading or a comprehensive, multi-component intervention. For students with more specific word reading and fluency needs, an intervention targeting those areas would have been appropriate but was beyond the scope of the current study. In addition, future research should consider how the various aspects of the intervention might have supported student learning.

It is important to note that the control group was a "business as usual" control condition, in which students received services that were available, given their existing needs and the resources of the collaborating schools. We chose to

include these students in the study to determine how this novel intervention compared with the intervention support the participating schools were able to provide. In some cases, students who were randomly assigned to the control condition received some sort of intervention from school staff. We collected information about the type of intervention, but were unable to document dosage, fidelity, or other aspects of the intervention. In other cases, students in the control condition may have received no additional school-provided intervention, and two students in the intervention condition received the intervention investigated in this study plus additional intervention. Given the ethical considerations of using a control group and the participating schools' obligations to provide intervention to students who are at risk, we supported school-based decisions about how to best to meet the needs of their students. However, these additional services are important to consider in interpreting the findings as some students in the control group also received additional intervention in reading comprehension. Likewise, it is also possible that students in either conditions received additional reading interventions outside school.

A final limitation is that this intervention focused on using one text genre in a single, thematic subject area. The design of the intervention would require some changes if social studies content, rather than science, were to be used for the intervention. Likewise, modifications would be needed if a different science topic were the focus of the intervention. We selected a topic for which there were available trade books at the appropriate reading level for this age group and linked to general education curriculum standards in science. Using different topics, different trade books, or a science textbook may yield different results. Future research on the use of the PLUG IN intervention strategies with other topics and text genres would support inferences about the effectiveness of this specific intervention package.

## Conclusion

In conclusion, we investigated a short-term reading comprehension intervention for fifth-grade students with comprehension difficulties. The intervention focused on informational science text and taught students a multi-component reading comprehension strategy for before, during, and after reading. There were significant findings favoring the intervention group on two proximal measures with moderate effect sizes, but these effects were not found on distal measures of reading fluency or reading comprehension. These findings suggest promise for future work on short-term interventions focusing on reading comprehension. Future work may need to focus on ways to increase student improvement through further study of the instruction components, the intervention conditions, and how best to assess responsiveness.

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