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Impacts of Comprehensive Reading Instruction on Diverse Outcomes of Low-Achieving and High-Achieving Readers

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Abstract

Low-achieving readers in Grade 5 often lack comprehension strategies, domain knowledge, word recognition skills, fluency, and motivation to read. Students with such multiple reading needs seem likely to benefit from instruction that supports each of these reading processes. We tested this expectation experimentally by comparing the effects of Concept-Oriented Reading Instruction (CORI) with traditional instruction (TI) on several outcomes in a 12-week intervention for low achievers and high achievers. Low achievers in the CORI group were afforded explicit instruction, leveled texts, and motivation support. Compared to TI students, CORI students scored higher on posttest measures of word recognition speed, reading comprehension on the Gates-MacGinitie Reading Test, and ecological knowledge. CORI was equally effective for lower achievers and higher achievers. Explicitly supporting multiple aspects of reading simultaneously appeared to benefit diverse learners on a range of reading outcomes.

Impacts of Comprehensive Reading Instruction on Diverse Outcomes of Low-Achieving and High-Achieving Readers

It is important to recognize that low-achieving readers in the later elementary grades are often relatively low in a variety of reading processes tied to reading comprehension including motivation (Guthrie et al., 2004), word recognition (Francis, Fletcher, Catts, & Tomblin, 2005), fluency (Kuhn & Stahl, 2003), comprehension strategies (NRP, 2000), and domain knowledge (Anderson & Pearson, 1984). Because these multiple components are moderately correlated, and each contributes to reading comprehension, reading instruction that is comprehensive across components is likely to be optimally effective (Guthrie & Wigfield, 2005). In the primary grades, it is possible that word recognition is more central to reading growth, and comprehensiveness may be less vitally important at this level.

Although reading comprehension depends heavily upon content knowledge, few studies of instruction for low-achieving students have attempted to improve students' subject-matter knowledge or its use in reading tasks. While some investigators advocate the use of information books to increase reading comprehension, quantitative studies have not been conducted on this factor (Dreher, 2003; Smolken & Donovan, 2003). Although authentic purposes for reading combined with explicit instruction in reading comprehension strategies for science texts were reported to increase comprehension of information text, the effects of this instruction for low achievers versus higher achievers were not examined (Purcell-Gates, Duke, & Martineau, 2007). Science IDEAS, which integrates science knowledge and reading comprehension instruction, has shown positive effects on both science knowledge and reading, for regular and at-risk students (Romance

& Vitale, 2001). However, the investigators have not attempted to teach and measure basic reading skills or motivation. In this study, we placed cognitive process instruction for word recognition and fluency in the context of a conceptual knowledge domain with the expectation that the rich knowledge context would facilitate fluency development.

Relatively few reading intervention studies have used a multifaceted approach to increase both word recognition and reading comprehension for low-achieving students. For example, in a meta-analysis of more than 100 instructional studies, Swanson (1999) distinguished between programs attempting to either improve word recognition or reading comprehension. For students lacking in word recognition, research on effective instruction often emphasizes phonemic awareness, letter-sound associations, and word recognition (Juel & Minden-Cupp, 2000; Moats, 2004). For extremely low achievers, Torgeson (2004) reported that explicit decoding instruction increased decoding skills substantially, but students' reading fluency was not significantly improved. Regarding reading fluency, Chard, Vaughn, and Tyler (2002) found 24 studies of instructional interventions to increase reading fluency in the forms of word recognition, speed, or oral reading fluency that were dominated by repeated reading. A literature review by Kuhn and Stahl (2003) and a meta-analysis by Therrien (2004) reported that repeated reading and wide reading were the most frequently implemented instructional designs in research on fluency development. It is evident that text comprehension strategies have rarely been included in studies that attempted to improve fluency for low achievers.

Attempts to improve reading comprehension for low-achieving students have usually consisted of direct strategy instruction. A meta-analysis showed that explicit instruction improved strategies such as questioning, using background knowledge, and

making graphic organizers (Gersten, Fuchs, Williams, & Baker, 2001). For example, low-achieving second graders can be taught the comprehension strategy of identifying text structure (Williams, 2003), and middle school students reading on a grade 2 or 3 level increased their reading comprehension by using the electronic concept mapping system of "Inspiration" (Mastropieri, Scruggs, & Graetz, 2003). However, these investigations did not attempt to increase fluency, subject-matter knowledge, or reading motivation.

One exception is a study in which decoding and fluency activities were taught daily and preceded systematic reading comprehension strategy instruction, which increased fluency and text comprehension (Manset-Williamson & Nelson, 2005). While the effects were moderate, the study shows that multiple cognitive outcomes can be taught. Foorman et al. (2006) observed a variety of instructional activities, including comprehension strategies and book reading, and found that they increased first and second grade students' reading comprehension. However, the effects were not differentiated for low- and high-achieving students. Investigations of comprehensive reading instruction for students in high-poverty schools showed that teachers' use of high-level questioning and complex literacy tasks are associated with reading comprehension growth, but the effects of these factors have not been documented for both low and high achievers (Taylor, Pearson, Peterson, & Rodriquez, 2003).

Researchers increasingly are interested in children's motivation for reading and how it relates to reading comprehension for low-achieving and high-achieving students (Baker & Wigfield, 1999; Guthrie et al., 2004; Morgan & Fuchs, 2007). Aspects of reading motivation shown to relate positively to reading comprehension include students'

self-efficacy for reading and intrinsic motivation to read. Unfortunately, many low-achieving students seek to avoid reading rather than to engage in it, which decreases achievement (Meece & Miller, 2001). Motivation and early reading achievement were found to be reciprocally determined, according to a review of 15 studies (Morgan & Fuchs, 2007). Early motivation and early reading skills were mutually supportive, driving each other upward (and downward), according to longitudinal data.

Effects of instructional interventions on reading motivation of low-achieving students have not often been studied experimentally. Although the benefits of Concept-Oriented Reading Instruction (CORI) on reading motivation have been shown for heterogeneous groups, the data have not been disaggregated for low achievers and high achievers (Guthrie, McRae, & Klauda, 2007). While investigators have proposed that low-achieving students can be motivated by relating their cultural experiences to text, (Ladsen-Billings, 1994; Rubie, Towsend, & Moore, 2004; Thorkildsen, 2002), or by adopting the practices of outstanding teachers (Bogner, Raphael, & Pressley, 2002), these suggestions have not been evaluated by comparing alternative instructional approaches. Furthermore, a meta-analysis of instructional interventions on motivation did not include any reference to whether the interventions and identified variables worked for low-achieving students (Guthrie & Humenick, 2004). The present study investigated the extent that instruction designed to increase the motivation and cognitive processes of reading would increase outcomes for both low-achieving and high-achieving students.

In this study, we used Concept-Oriented Reading Instruction (CORI), which integrates support for motivation, fluency, content knowledge, and reading comprehension based on the engagement model of reading development (Guthrie &

Wigfield, 2000). As just noted, although CORI has been investigated for heterogeneous groups of students in grades 3 to 5 in regular classrooms, its effects on low-achieving students had not been investigated. To expand this model for low-achieving readers directly, we suggest that it is valuable to support the following processes: (a) reading motivation, (b) oral reading fluency, (c) knowledge development in a specific domain, and (d) reading comprehension. The integration of these instructional components has been shown to increase elementary school students' reading comprehension on standardized reading tests and experimenter-based tests (Guthrie et al., 2004; Souvignier & Mokhlesgerami, 2006), but this instructional effect has not been documented for low-achieving students. In this study, students were taught language arts/reading in self-contained classrooms with whole class instruction, and with guided reading provided to subgroups within the classroom.

We investigated the extent that CORI increased students' reading comprehension, content knowledge, word and passage fluency, inferencing, and reading motivation in comparison to traditional instruction using basal readers. We examined whether the effects occurred for both low-achieving students and high-achieving students within the classrooms. The following hypotheses guided the study:

1. CORI students will show higher reading comprehension at posttest than TI students after adjusting for pre-existing differences on this variable.
2. CORI students will show greater knowledge of ecology in life science at posttest than TI students after adjusting for pre-existing differences on this variable.
3. CORI students will show higher inferencing in reading at posttest than TI students after adjusting for pre-existing differences on this variable.

4. CORI students will show higher word recognition at posttest than TI students after adjusting for pre-existing differences on this variable.
5. CORI students will show higher fluency at posttest than TI students after adjusting for pre-existing differences on this variable.
6. CORI students will show higher motivation scores at posttest than TI students.
7. Low-achieving students and high-achieving students will both show an advantage of CORI over TI.

Method

Participants

Grade 5 students from three schools in the Mid-Atlantic region of the USA participated in the study. Data from 94 students from three classrooms in each of two schools (totaling six classrooms) represented Concept-Oriented Reading Instruction (CORI) and data from 62 students of three classrooms in one school represented traditional instruction (TI) for a total of 156 students. The numbers of Ss were: CORI-Low Achieving = 41; CORI-High Achieving = 53; TI-Low Achieving = 22; TI-High Achieving = 40. The study was a pretest-posttest equivalent groups quasi-experimental design (Pedhazur & Schmelkin, 1991). The two treatment groups were not significantly different ($p < .05$) at pretest on any of the measures of word recognition, passage oral reading fluency, inferencing, the Gates-MacGinitie Reading Comprehension Test, or the Woodcock-Johnson Fluency Test. To attain comparability on pretest scores, the highest scoring TI class and the lowest scoring CORI class were deleted from the analyzed sample; also one class from the CORI group with a high proportion of ELL students (45%) and one class from the CORI group with a high proportion of students with IEPs for writing (who could not participate fully in the reading program) were deleted from the

analyzed sample. This optimized comparability across the TI and CORI samples. On the pretest of the Gates-MacGinitie Comprehension, the grade equivalents of the groups were as follows: CORI- low $M = 3.0$; TI- low $M = 2.8$; CORI high- $M = 6.2$; TI- high $M = 5.7$.

Demographic characteristics of the student participants are shown in Table 1. The CORI group had a higher percentage of girls (54%) than the TI group (40%), but this difference was not statistically significant. Comparable proportions of ELL students and students assigned to Special Education, and African American and Hispanic students were in both instructional programs. In the September pretest, the Gates-MacGinitie Reading Comprehension Test mean grade equivalent was 4.93 for CORI and 4.54 for TI, which was not a statistically significant difference. There were a total of nine ELL students, five of whom were in the CORI-Low group, as shown in Table 2. Due to this low number of ELL students, their data could not be analyzed separately, and this subgroup was not likely to affect the results of the data analyses. Thus, the two instructional groups were comparable in demographic characteristics. Subgroups of low achievers and high achievers were formed for statistical analysis by partitioning the sample at the median of the Gates-MacGinitie Comprehension Test scores on the pretest, which was a 4.0 grade equivalent. Within the low achievers in CORI, 7% were designated as Special Education, and within low achievers in TI, 22% were designated as Special Education. In the low achieving groups, for CORI, 12% were English language learners (ELLs) and for TI, 14% were ELLs. None of these proportions was significantly different from each other.

Measures

All cognitive assessments were administered by the teachers with guidance and monitoring by the researchers. The motivation assessments were administered by the researchers.

Reading comprehension. The Comprehension section of the Gates-MacGinitie Reading Test (Form S in September as a pretest and Form T in December as a posttest) was administered. The Vocabulary section was not administered due to lack of testing time allowed by the schools. Students were given either a Level 4, 5, or 6 test, based on the teachers' rating of students' reading abilities as below-grade level, on-grade level, and above-grade level respectively. Each test has 48 multiple choice items aligned to 11 separate passages, equally divided between fiction and information texts. We used the extended scale score for data analysis. Validity and reliability are known to be high (MacGinitie, MacGinitie, Maria, & Dreyer, 2000).

Ecology knowledge. Consistent with research on conceptual learning in science education (Romance & Vitale, 1992), ecology knowledge was defined as a structured set of higher-order concepts of the following: community with plant-animal interactions such as mutualism, commensalism, predation, and amensalism, in concert with survival concepts such as feeding, locomotion, communication, and reproduction (Barbosa & Alexander, 2004). Each test consisted of 19 multiple choice items on the concepts, illustrative evidence, and vocabulary. Factor analysis of the posttest scores showed one factor accounting for 26.4% of the variance, and Cronbach alpha was .83.

Inferencing. For this study, an inference was a connection between propositions in text formed from generating a logical relationship between two propositions in the text or between a proposition in the text and prior knowledge (Hannon & Daneman, 2001;

Kintsch, 1988- similar to Hannon & Daneman [2001]). We measured inferencing with True-False sentences based on a passage. The test consisted of one information passage and one fiction passage from the Gates-MacGinitie Reading Test. For each passage, 6 items were composed consisting of 3 true inferences and 3 false inferences, which varied in amount of the passage to be processed. Different inferencing tests were constructed for both pretest and posttest forms of Levels 4, 5, and 6 of the Gates-MacGinitie Reading Test. Students were given the same form and level of the inferencing test as the form and level of the Gates-MacGinitie. The inferencing test was administered after the Gates in each testing period, and thus would not likely influence the Gates scores. Cronbach alpha was .41-.55 for Levels 4 to 6.

Word recognition assessment (WRA). For this study, we defined word recognition as the rate at which students correctly identified individual words that were presented in list form. This has been compared to other measures of fluency, strategy use, and background knowledge in Klauda and Guthrie (2008). Two word lists were created that corresponded with each stimulus text, which were passages from the Gates-MacGinitie. This enabled us to examine word recognition on the same texts that were used to measure comprehension. The lists varied in length from 28 to 44 words. The lists for each text were created by first placing all unique words from the text in order by length, with the exception that proper nouns were placed at the end of the list. The full list was then divided in half, alternately placing the ordered words on separate lists (List A and List B). Students received either List A or List B corresponding to one of the stimulus passages for their assigned level, using a counterbalancing system detailed in the Procedure section.

Research team members individually administered the WRA using the following directions:

> I'm going to give you a list of words to read aloud. You'll begin at the top left of the list and read down each column. You may use your finger to help keep your place if you would like. Read the words as quickly as you can without making mistakes. If you come to a word that you don't know, skip it, and go to the next word. Continue reading either until I ask you to stop or until you finish the entire list. I'm going to use a stopwatch to see how long it takes you. Do you have any questions?

After reading these directions aloud, the administrator gave the student a practice list comprised of six words and then the test list. During the testing phase, the administrator marked any words that the student read incorrectly or omitted, and used a stopwatch to record the total time, in seconds, that it took the student to read the full list. To prevent frustration, if the student missed five or more words in a row, the administrator politely directed the student to stop reading; all subsequent words were marked incorrect. Test administrators were advised to be somewhat conservative in considering words as correct, but sensitive to variations in pronunciation due to dialect, accent, or speech difficulties. The WRA was scored by totaling the number of words read correctly per minute, or word reading speed, as the variable is designated in the present study. In addition, word accuracy was determined by calculating the percentage of words each student read correctly. However, consideration of the high mean for percent correct (91.6), in combination with the fact that the standard deviation for words correct per minute was nearly twice that for percent correct (26.0 versus 13.5), led to the decision to

use only words correct per minute in our analyses. Reliability for the WRA was determined by calculating the test-retest correlation for word reading speed for a quarter of the original sample, who were re-tested three months later with word lists based on different passages. This test-retest correlation was .72.

Woodcock-Johnson III Reading Fluency Test. Performance on the Reading Fluency test from the Woodcock-Johnson III Diagnostic Reading Battery (WJ-III DRB) measured fluency at the syntactic level, defined in this study as accuracy and speed in processing phrase and sentence units of text. This test consists of 98 simple sentences (e.g., "Ants are small." and "A puppy grows into a cat."). Students were directed to read as many of these sentences as possible within three minutes, circling Y for "yes" or N for "no" after each sentence, depending on whether it was a true or a false statement. Test scores equaled the number of correct responses minus the number of incorrect responses. The raw score associated with a grade equivalency of 5.0 is 43. The internal consistency coefficient for age 10 is .90, and the one-year test-retest reliability for students who first take the test at ages 8-10 is .78 (Schrank, Mather, & Woodcock, 2004). It should be noted that the test publishers provide instructions for administering the test individually or to small groups of students. We adapted these instructions in order to administer the test on a classroom basis, by each classroom teacher, with the assistance of a research team member.

Passage Oral Reading Assessment. Fluency at the passage level for this study was defined as expressive oral reading of expository or narrative text. The Passage Oral Reading Assessment (PORA) used for this measure has been employed previously and

found to contribute to reading comprehension independently of word recognition and background knowledge (Klauda & Guthrie, 2008).

The PORA used students' oral renderings of an intact passage, either one of the two passages selected as stimulus texts from the Gates-MacGinitie, to examine oral reading for the same text used in the reading comprehension measure. Data were recorded with a Sony digital recorder. Directions for this task were the following:

> I'm going to give you a passage to read aloud. Read it as expressively as you can. It's important to make it sound interesting. You don't have to read it quickly. If you come to a word that you don't know, skip it, and go to the next word. Continue reading either until I ask you to stop or until you finish the passage.

An oral reading fluency rubric was developed to evaluate the students' passage reading on five dimensions: (a) phrasing, (b) pace, (c) smoothness, (d) word expressiveness, and (e) passage level expressiveness. Students were rated on each dimension on a scale of 1 (very weak on the dimension) to 4 (very strong on the dimension). The scores were totaled for an oral reading fluency score, which was used in statistical analyses.

On the passage expressiveness dimension, students' scores were based on their oral interpretation of the passage as a whole, including the appropriateness and consistency of the mood or tone created by their oral reading. If their reading evoked no mood or tone, they received a 1. If approximately a quarter of the passage was interpreted expressively, they received a 2. If half to three-quarters of the passage was read with a consistent tone, they received a 3, and if they read the whole or nearly the whole passage in an expressive manner that created a mood or tone that seemed in accord with the

author's intention, they received a 4. The scale for phrasing was drawn largely from the NAEP fluency rubric (Pinnell et al., 1995). On this dimension, students received a 1 if they read primarily word-by-word, a 2 if they read primarily in two-word phrases, a 3 if they read primarily in three- or four-word phrases or in run-on sentences, and a 4 if they read primarily in larger, meaningful units. Other levels were coded similarly.

Three judges received training in using the fluency coding rubric and then independently rated the readings of 16 students on the five dimensions. Interrater reliability was calculated as the percentage of time that each pair of judges gave exact and adjacent or exact scores. Judges 1 and 2 assigned exact scores 50% of the time and adjacent or exact scores 97% of the time. Judges 1 and 3 assigned exact scores 57% of the time and adjacent or exact scores 96% of the time. Judges 2 and 3 assigned exact scores 46% of the time and adjacent or exact scores 89% of the time. After resolving discrepancies on the interrater cases through discussion, Judge 1 scored two-thirds of the remaining recordings, and Judge 2 scored one-third of the remaining recordings. The levels of interrater agreement obtained are comparable to those obtained by NAEP judges using their fluency rubric (58% exact, 98% adjacent or exact). Furthermore, a median *r* of .70 was obtained when the ratings of the three judges for the present study were correlated with each other, indicating substantial interrater agreement.

Motivation measures: Overview. Students' motivation was measured by a questionnaire that assessed different components of students' motivation identified in previous research (Morgan & Fuchs, 2007) including reading self-efficacy, perceived difficulty in reading, intrinsic motivation to read, and reading avoidance.

Self-efficacy. Students' belief in their capacity to read well, which is consistent with the theoretical literature, is referred to as self-efficacy (Schunk & Zimmerman, 1997). The measure contained 7 items, each consisting of a question and a Likert-response format. For example, two questions were: "Can you sound out long words?" and "Do you think you will do well in reading next year?" Two questions were worded negatively and reverse coded. The response format was (1) Never, (2) Not usually, (3) Usually, and (4) Always. (see Appendix A). Scores for each item were summed for a scale score. The measure was administered to groups of 5 students, grouped according to their reading ability in a quiet room. The administrator read each item aloud, encouraged students to be honest, and suggested that they cover their answers with a blank paper that was provided. Students were assured that their answers were confidential and would not be given to their teacher or parents. The items were judged to be theoretically cogent measures of self-efficacy. To determine their internal consistency, we conducted a factor analysis of those theoretically derived items. Based on factor analysis, two items were deleted, leaving a 5-item scale, which had a Cronbach alpha of .71. Scale scores were divided by the number of items for comparability across scales.

Perceived difficulty. Students' perception that reading tasks are difficult for them was defined in this study as perceived difficulty. This is consistent with studies of this construct of self-efficacy, also termed self-concept of ability, with younger students (Chapman & Tunmer, 1995). To measure perceived difficulty, we constructed items each consisting of a question and a Likert-response format. For example, two questions were: "Do you make lots of mistakes in reading?" and "Are the books you read in class too difficult?" Two questions were worded negatively and reverse coded. The response

format was (1) Never, (2) Not usually, (3) Usually, and (4) Always. (see Appendix A). Scores for each item were summed for a scale score. The administration was the same as for self-efficacy, and occurred in the same session. Based on factor analysis, all items were retained leaving a 7-item scale, which had a Cronbach alpha of .76. Scale scores were divided by the number of items to construct comparability across scales for the sample.

Intrinsic motivation. Intrinsic motivation was conceptualized as reading for enjoyment and curiosity with a preference for challenging reading activities (Ryan & Deci, 2000; Wigfield & Guthrie, 1997). To measure intrinsic motivation, we constructed 7 items each consisting of a question and a Likert-response format. For example, two questions were: "Do you enjoy reading books in your free time?" and "Do you like it when books make you think?" One question was worded negatively and reverse coded. The response format was (1) Never, (2) Not usually, (3) Usually, and (4) Always (see Appendix A). Scores for each item were summed for a scale score. The administration was the same as for self-efficacy, and occurred in the same session. Based on factor analysis, two items were deleted leaving a 5-item scale, which had a Cronbach alpha of .83. Scale scores were divided by the number of items for comparability across scales.

Avoidance. The construct of avoidance was defined as students' avoidance of reading and disaffection with reading activities. It is consistent with previous conceptualizations of avoidance (Meece & Miller, 2001) and work avoidance in reading (Baker & Wigfield, 1999). To measure avoidance, we constructed 7 items, each consisting of a question and a Likert-response format. For example, two questions were: "Do you try to get out of reading books for school?" and "Do you read easier books so

you won't have to work as much?" One question was worded negatively and reverse coded. The response format was (1) Never, (2) Not usually, (3) Usually, and (4) Always. (see Appendix A). Scores for each item were summed for a scale score. The administration was the same as for self-efficacy, and occurred in the same session. Based on factor analysis, one item was deleted leaving a 6-item scale, which had a Cronbach alpha of .82. Scale scores were divided by the number of items for comparability across instructional conditions.

Concept-Oriented Reading Instruction (CORI)

Overview. For Grade 5, CORI was structured in a form similar to its implementation in grades 3 and 4, which have been described elsewhere (Guthrie et al., 2004; Guthrie, Wigfield, & Perencevich, 2004). The reading goals were consistent with the district goals, including reading comprehension with an emphasis on inferencing and comprehension monitoring. Monitoring included a detection phase and 10 fix-up strategies such as rereading, chunking, questioning, activating background knowledge, and connecting to prior text. We emphasized oral reading fluency and text-based writing as language arts goals. Five instructional practices were implemented to support motivation: (1) conceptual theme of ecological communities; (2) affording students control and choice; (3) arranging collaboration for reading; (4) supporting self-efficacy through text selection and student goal setting; and (5) increasing interest through hands-on science activities.

For all students, the daily instructional sequence was 90 minutes consisting of: (a) science goals (either hands-on science and conceptual content learning), or fluency activities (such as paired reading or a teacher read-aloud [20 min]); (b) guided reading (a

10-minute whole class lesson using a class set of books, followed by a 30-minute guided reading lesson to each of 3 small groups of 4 to 6 students who were grouped by reading level); low-achieving readers were given a guided reading lesson at this time; (c) writing, in which students created summaries, charts, graphic organizers, and narratives related to their texts; and (d) independent reading, consisting of stories, novels, and extended information book reading on the conceptual theme. Within this context, low-achieving readers participated in all activities.

In the CORI program for low-achieving readers, the students were taught daily in small groups of 3 to 6 students. Low-achieving reader lessons were written as a supplement to the existing CORI lessons that were designed for on-grade and above-grade students. The classroom teacher provided these lessons 3 days per week, and the reading specialist provided the lessons 2 days per week. Although the science concepts and reading strategies were identical to those taught to the whole class, teachers spent more time modeling strategies, and focused on fewer concepts at one time. Low-achieving reader lessons included additional fluency practice, more time on word recognition strategies, and more explicit inferencing instruction. For low-achieving readers, teachers retained the principal CORI components of emphasis on concepts, interesting texts, fluency, reading comprehension, and motivational practices. As fully as possible they afforded students choices, relevance of text, successful reading experiences, collaborations, and a conceptual theme. We next describe these components in further detail.

Motivational Practices for all Students in CORI

Choices. All students were given some control over their reading and limited choices in systematic forms daily during instruction. At specified points in instruction, choices were given over texts, subtopics for focused reading, novels for a book club, and selected writing activities. This resulted in a strong sense of autonomy for the low-achieving readers, who may not have been given many choices in previous instruction. Students' effort and perseverance, especially for challenging texts, was increased as a result. More detail on autonomy support can be found on the CORI Website at www.cori.umd.edu.

Relevance. All students' interest in plant-animal communities was initially sparked by the hands-on activity of observing and examining a live horseshoe crab (which is a mobile community), which was furnished for each classroom. Continuing interest was sustained by connecting texts to the students' experiences and assuring that students' knowledge accumulated continually, making the progression of texts meaningful over the 12-week period. The practice of relevance refers to connecting texts to immediate experience, such as the science observations. For further evidence on the effects of using stimulating tasks during instruction to build relevance of texts see Guthrie, McRae & Klauda (2007).

Success. All students were provided trade books at their reading level. Low-achieving readers were provided several texts on the Grade 3 or Grade 4 level. Texts on either a Grade 2 or Grade 3 level were available for the lowest achievers. The texts were on-grade or above-grade level for higher-achieving readers. A booklist is provided in Appendix B. Books for low-achieving readers were selected based on content, reading

level, and interest. All expository and narrative books about plants and/or animals for grades 2 to 4 reading levels (publisher determined) were used for low-achieving readers. They contain colorful and exciting illustrations, either accurately drawn or clearly photographed. Because teachers made the books available at all times, not just during the lesson, students felt a sense of ownership of these books and enjoyed reading about the same concepts as the rest of the class. Teachers made determinations as to the appropriate text level for each student, and assigned amounts of reading that were both challenging and manageable within each guided reading lesson. Depending on the lesson's focus, students may have read only one page for the day to practice a particular reading strategy. Narrative texts were often used to develop students' fluency, and larger amounts of text were read when learning to make inferences.

Collaboration. Students were also given the chance to collaborate on a daily basis. They read aloud together in a small group or with a partner for fluency development. During strategy instruction after initial modeling, they decided on which reading strategy to use and then practiced that strategy together. Partners discussed what they had read or how the strategy worked. Teachers used partner reading as an opportunity for low-achieving readers to hear a peer model reading fluently. Within the instruction for low-achieving readers, collaborations were also provided.

Thematic units. By focusing on an ongoing theme of plant-animal communities, teachers enabled students to gain deep conceptual knowledge and become "experts," something they may not have experienced before. The conceptual theme enabled students to improve the fluency of their oral reading because the familiar content area increased students' expressiveness and prosody. In strategy instruction is it easier to teach

questioning or rereading in a familiar content domain because the meaningfulness of the information constructed from using the strategy is more obvious. A thematic unit is motivating because students are excited to become knowledgeable about the domain, and thus, their efforts to read for meaning are rewarded. For the conceptual theme, students learned the concepts of animal-plant interactions in an ecological community. These concepts included mutualism, commensalism, predation/parasitism, and amensalism. Students learned the survival concepts of feeding, locomotion, communication, reproduction, defense, respiration, predation, competition, adaptation to habitat, niche, and habitat conservation. Texts on this theme included trade books on environmental science, poetry, novels, and legends. To reinforce these concepts for low-achieving students, teachers used posters with graphic representations and focused on fewer concepts at a time, as compared to the whole class instruction. Low-achieving readers used modified charts that required less writing than those for the whole class. Using the same concepts with the low-achieving readers during their additional instruction as their classmates gave these students the message that they were fully capable of learning the same material. They did, in fact, believe that they became "experts" in animal and plant interactions.

Fluency instruction. During both whole class and small group instruction, teachers guided low-achieving readers in reading fluently. Fluency in this case refers to reading with speed, accuracy, and expression. Teachers modeled fluent reading on a daily basis, both from expository and narrative text. Low-achieving readers were encouraged to read text "to make it sound interesting." After modeling fluent reading, teachers monitored students as they read aloud in small groups, with partners, or individually.

Individual reading was usually one-on-one with the teacher, allowing the teacher to prompt and to support the student while other students read with partners.

At least twice weekly, students practiced reading aloud fluently as a class. Low-achieving readers then read with the reading specialist within both CORI and TI classrooms. Teachers typically began the guided reading lessons by reading aloud from the text to model fluent reading, and then students would practice reading aloud with partners. Teachers worked with low-achieving readers with deficient decoding skills individually while the others read in pairs. Receiving direct instruction with the whole class, listening to the teacher model fluent reading, hearing other low-achieving readers practice, and finally, receiving one-on-one instruction provided them with a thorough immersion in word recognition activities. In a designated section of the CORI and TI classrooms, these sessions for low-achieving readers were provided by the regular teacher on some days and by the reading specialist on other days.

Reading comprehension. Low-achieving and high-achieving readers were taught to monitor their text comprehension by using fix-up strategies for words they did not know, to identify the main idea and supporting details in text, and to make inferences as they read. These strategies were taught to the entire class through direct instruction. They were modeled by the teacher and implemented by the students during guided reading. Posters around the classroom listed the strategies so that students could refer to them while reading and writing. The fix-up strategies (reread, use a picture, chunk it, discuss with a partner, draw it, look it up, read ahead, and read aloud) were used when a student encountered an unfamiliar word while reading. Students were taught to identify a difficult word and apply one of the strategies. Once students mastered these strategies with

individual words, teachers modeled the same strategies to "fix up" a confusing sentence. As with a difficult word, students identified a confusing sentence and then applied the strategies to make it manageable. These strategies gave low-achieving readers the tools needed to comprehend text. Again, these were the same strategies that the whole class was learning, taught at a slower pace with more modeling, and with more attention to fix-up strategies.

In guided reading with low-achieving readers, teachers emphasized finding the main idea and supporting details. Using text notes (sticky notepaper), students identified the main idea of the paragraph or page they had just read. Eventually, they found the supporting details and made connections between these facts to arrive at the overall concepts. Teachers spent time modeling and discussing these ideas in the small groups, or students discussed what they found with a partner. Low-achieving readers were taught to use the information gathered from the text to come to a conclusion and create conceptual knowledge; the skill of inferencing. For example, by reading that a clownfish lives on a sea anemone and that the sea anemone stings other animals, students may infer that the fish is gaining protection from the anemone. Teachers reported that students enjoyed finding these connections.

Traditional instruction. Traditional instruction was provided in three classrooms in a school selected by the district to be comparable to the CORI and strategy instruction (SI) schools. Teachers provided their normal reading and language arts instruction with basal materials, trade books, and vocabulary books. We collected pretest and posttest data, but did not provide professional development or any materials to these classrooms.

The daily instruction was 90 minutes consisting of work in a basal reader, supplemented with word recognition and fluency activities. The fluency work included group repeated reading and choral reading of vocabulary. Guided reading was provided for three groups of 4 to 5 students who were grouped by reading level. Low-achieving readers were given a guided reading lesson at this time by the classroom teacher 3 days per week and by the reading specialist 2 days per week. Writing instruction consisted of sentence completion in comprehension lessons, and story writing in a writer's workshop format. Approximately twice a week for 20 minutes, time was given for independent reading, consisting of self-selected stories or novels. Within this context, low-achieving readers participated in all activities.

Professional Development

A summer workshop provided professional development for CORI teachers. They participated in a 3-day workshop that included viewing examples of instruction, performing the reading strategies, discussing motivational practices, constructing reading/science integrations, reviewing books for this instruction, and adapting a teacher's guide created by the project's staff. Ongoing workshops for follow up mentoring were provided monthly for CORI teachers (see Guthrie, 2004).

Implementation of Instructional Models

CORI was implemented in six classrooms in two schools to all fifth-grade students. These students had not experienced CORI in any previous grade, and only two of the six CORI teachers were familiar with the program. The CORI program was administered for 12 weeks, from the second week in September to the second week in December. Class size in one school averaged 22 students, and in the other school it

averaged 27 students. Both schools taught the model for 90 minutes daily, in the afternoon. TI was implemented for all fifth-grade students in three classrooms of one school from the second week in September to the second week in December for 90 minutes each afternoon. CORI and TI students who were reading at the 2.0 level or below in September of Grade 5 were taught out of the classroom by special education teachers for 30 minutes, approximately three times per week, in addition to their classroom instruction. Low-achieving readers, who were not eligible for special education or were not more than two years below grade level in reading, were taught within the classrooms by classroom teachers 3 days per week for all models. Reading specialists in CORI and TI provided 20 minutes of instruction within the classrooms 2 days per week.

Implementation Quality

Each of the 6 CORI teachers was observed during a guided reading lesson on two non-consecutive days. Teachers typically met with six students at a time for 20 minutes. A 57-item observation form was created to record the frequency and quality of the teacher behavior supporting the dimensions identified as central to CORI for low-achieving readers. The 57 items were delegated to dimensions which were chosen based on the reading comprehension and motivation goals of instruction: concepts, text usage, fluency, decoding, inferencing, writing, collaboration, choice, confidence, and interest. Checkmarks indicated observation of a particular instructional behavior, and whether the implementation was of low or high quality. Each instructional behavior was coded 1 to 5 based on these checks (1 = no checks, 5 = item observed throughout entire lesson at a high quality level). Item scores were then added for each dimension and a percentage was then calculated based on the total possible score. Interrater agreement between two

independent raters on frequency of observed behaviors was 83%, and agreement on the quality of instructional behavior was 87%. All teachers met or surpassed a level specified for full implementation of CORI, according to these observations. Three independent raters verified the traditional instruction implementation by observing classrooms on two occasions that were acceptable to the teachers. The use of a basal program, trade books, daily fluency activities, and vocabulary development were systematically implemented. Previously, we have reported the implementation of traditional instruction in this school to be strong (Guthrie et al., 2004), and the scaffolding of reading comprehension by teachers in that school to result in high levels of student reading engagement (Lutz, Guthrie, & Davis, 2006). In this school, low-achieving readers were taught in small groups by the regular teacher 3 days per week and by the reading specialist 2 days per week. They used a guided reading rotation similar to the grouping plan in the CORI schools. The reading specialist emphasized scaffolding and repeated reading for fluency development.

Procedures

The assessments were given in September (pretest) and December (posttest). Over a 2-day period, in their regular classrooms, teachers administered the Gates-MacGinitie Reading Test (45 min.), ecology knowledge assessment (15 min.), Woodcock-Johnson Fluency (10 min.), and inference assessment (20 min.), in that order. Following that, graduate students administered the four motivation measures in a separate room, for approximately 20 minutes. Items from all scales were randomly ordered and administered in the same session. Graduate students administered the Word Recognition Speed test and the Oral Reading Fluency test individually to students in a quiet room. Instruction was

provided from the first week in September to the third week in December, for a total of 12 weeks of instruction for each group.

Results

Each hypothesis of the study was examined with a 2 (Instructional treatments) X 2 (Achievement groups) Analysis of Covariance in which the dependent variable was the posttest of the measure of interest. In each analysis, the independent variables were the instructional treatments of CORI and TI and the achievement groups of low and high. The covariate was the same variable as the posttest but was administered as a pretest. The unit of analysis was the unit in which small group instruction occurred. Students were assigned to a classroom as a treatment (CORI or TI) and to a group (high or low based on the median split) as an instructional unit with distinctive text and instructional activities. Students were assigned, for example, to CORI-low, CORI-high, TI-low, and TI-high. For the analysis the numbers of instructional units were: CORI-low (5), CORI-high (6), TI-low (3), or TI-high (3). The ANCOVA was selected in favor of repeated measures Analysis of Variance due to the increased power of ANCOVA, and because there was no significant correlation between the pretest and the gain in the variables, thus mitigating problems of multicollinearity. Each ANCOVA met the assumption of homogeneity of regression (equivalent slopes). In each analysis the interaction term of the instructional treatment and the covariate was not statistically significant. The results are displayed showing the means and standard deviations for the posttest in Table 3 and the means and standard deviations for the pretest in Table 4. The correlations among the reading achievement and cognitive variables for the pretest and posttest are presented in Table 5. Correlations among motivation variables and reading achievement variables for the

posttest are presented in Table 6. At the posttest, the CORI low-achieving group had a mean of 3.7 grade equivalent and the TI low-achieving group had a mean of 3.3 grade equivalent on the Gates MacGinitie. The CORI high-achieving group had a mean of 6.5 grade equivalent and the TI high-achieving group had a mean of 5.9 grade equivalent on the Gates MacGinitie.

The first hypothesis was that the CORI students will show higher reading comprehension than TI students on the posttest after adjusting for initial levels of this variable on the pretest. For the 2 (Instructional Treatments) X 2 (Groups) ANCOVA we used the Gates-MacGintie Reading Comprehension posttest as the dependent variable, and the Gates-MacGinitie Reading Comprehension pretest as the covariate. This analysis met the assumption of homogeneity of regression, as stated previously. The result was that CORI (M = 505.00) was significantly higher than TI (M = 486.63) with an effect size of ES = .59, (F = 4.86 df = 1,12, p < .048). The ES was computed with the difference of means as the numerator and the pooled standard deviation as the denominator. The effect for Achievement group was not statistically significant (F < 1) and the interaction of Instructional treatment and Achievement group was not statistically significant (F < 1).

The second hypothesis was that the CORI students will show higher Ecological knowledge than TI students on the posttest after adjusting for initial levels of this variable on the pretest. For the 2 (Instructional Treatments) X 2 (Groups) ANCOVA we used the Ecological knowledge posttest as the dependent variable, and the Ecological knowledge pretest as the covariate. This analysis met the assumption of homogeneity of regression, as stated previously. The effect for Instruction was that CORI (M = 13.45) was significantly higher than TI (M = 7.10) with an effect size of ES = 1.59, (F = 23.16, df =

1,12, $p < .001$). The effect for Achievement group was not statistically significant ($F < 1$) and the interaction of Instructional treatment and Achievement group was not statistically significant ($F = 2.09$ $df = 1,12$, $p = .17$).

The third hypothesis was that the CORI students will show higher Inferencing than TI students on the posttest after adjusting for initial levels of this variable on the pretest. For the 2 (Instructional Treatments) X 2 (Groups) ANCOVA used the Ecological knowledge posttest as the dependent variable, and the Inferencing pretest as the covariate. This analysis met the assumption of homogeneity of regression, as stated previously. The effect for Instruction was not statistically significant at the p value of .05. However, it is interesting to note that CORI ($M = 9.26$) was marginally higher than TI ($M = 8.70$) with an effect size of ES = .54, ($F = 3.91$, $df = 1,12$, $p < .07$). The effect for Achievement group was statistically significant. The High group ($M = 9.61$) was higher than the Low group ($M = 8.45$), with an effect size of ES = 1.12, ($F = 5.56$, $df = 1,12$, $p < .04$). The interaction of Instructional treatment and Achievement group was not statistically significant ($F = 3.04$ $df = 1,12$, $p = .11$).

The fourth hypothesis was that the CORI students will show higher Word Recognition than TI students on the posttest after adjusting for initial levels of this variable on the pretest. For the 2 (Instructional Treatments) X 2 (Groups) ANCOVA used the Word Recognition posttest as the dependent variable, and the Word Recognition pretest as the covariate. This analysis met the assumption of homogeneity of regression, as stated previously. The effect for Instruction was that CORI ($M = 93.09$) was significantly higher than TI ($M = 76.68$) with an effect size of ES = .87, ($F = 7.52$, $df = 1,12$, $p < .02$). The effect for Achievement group was not statistically significant ($F < 1$)

and the interaction of Instructional treatment and Achievement group was not statistically significant ($F = 2.86$ $df = 1,12$, $p = .12$).

The fifth hypothesis was that the CORI students will show higher fluency on the than TI students on the posttest after adjusting for initial levels of this variable on the pretest. We examined this hypothesis using the Woodcock-Johnson Fluency measure. For the 2 (Instructional Treatments) X 2 (Groups) ANCOVA, using the Woodcock-Johnson Fluency measure posttest as the dependent variable and the Woodcock-Johnson Fluency measure pretest as the covariate, we found that the Instructional effect was not statistically significant ($F = 1.02$ $df = 1,12$, $p = .33$). The effect for Achievement groups was significant, with the High group ($M = 111.04$) higher than the Low group ($M = 93.46$), $F = 5.05$, $df = 1,12$, $p < .04$, with an effect size of ES = 1.68. The interaction of Instruction and Group was not statistically significant ($F < 1$). We also examined this hypothesis using the Passage Oral Reading Fluency measure. The 2 (Instructional Treatments) X 2 (Groups) ANCOVA, using the Oral Reading Fluency measure posttest as the dependent variable and the Oral Reading Fluency measure pretest as the covariate, showed that an Instructional effect was not statistically significant ($F = 2.20$ $df = 1,12$, $p = .17$). The effect for Achievement groups was not significant ($F = 2.20$ $df = 1,12$, $p = .17$), and the interaction of Instruction and Group was not statistically significant ($F < 1$).

The sixth hypothesis was that CORI students will show higher motivation in the posttest than TI students. The ANCOVA of 2 (Instructional groups) X 2 (Achievement groups) with a posttest motivation measure as the dependent variable showed no statistically significant effects for Instruction, and no statistically significant effects for the interaction of Instruction and Achievement groups. For self efficacy, the effect of

Instructional group was not significant (F <1), the effect of Achievement group was not statistically significant (F = 4.04, df = 1,13, p = .07), and the interaction effect of Instructional group by Achievement group was not statistically significant (F < 1). For perceived difficulty, the effect of Instructional group was not significant (F <1), the effect of Achievement group was statistically significant (F = 34.32, df = 1,13, p < .000), and the interaction effect of Instructional group by Achievement group was not statistically significant (F = 1.07, df = 1,13, p = .32). For intrinsic motivation, the effect of Instructional group was not significant (F <1), the effect of Achievement group was statistically significant (F = 9.37, df = 1,13, p < .009), and the interaction effect of Instructional group by Achievement group was not statistically significant (F <1). For avoidance, the effect of Instructional group was not significant (F = 2.28, df = 1,13, p = .15), the effect of Achievement group was statistically significant (F = 9.03, df = 1,13, p < .01), and the interaction effect of Instructional group by Achievement group was not statistically significant (F < 1).

The correlations of motivation and the achievement variables were statistically significant in many cases (see Table 5). Note especially that perceived difficulty and avoidance were consistently correlated with reading achievement variables in the posttest. In addition, motivation variables were consistently associated significantly with each other. Tests for the seventh hypothesis were embedded in the previous tests, and were reported within prior paragraphs.

Discussion

A primary goal of this investigation was to attempt to increase reading comprehension among low-achieving readers using an integrated approach to instruction.

The low-achieving readers were defined as students entering fifth grade who were below the median of all scores on the Gates-MacGinitie Reading Comprehension Test, which was a grade equivalent of 4.0. The high-achieving readers were defined as students who tested on the Gates-MacGinitie Comprehension Test at a grade equivalent 4.0 or higher entering Grade 5. One important outcome was that the comprehensive instruction offered in CORI appeared to increase students' levels on multiple outcome variables including reading comprehension, word recognition, and content knowledge of ecology. Thus, these diverse cognitive and conceptual needs of low-achieving readers were at least partially met. As we mentioned previously, interventions for low achievers tend to focus on one cognitive target, such as word recognition, oral reading fluency, or reading comprehension strategies. These findings suggest that educational goals of comprehension, content knowledge, and word recognition can productively be included in instruction for low-achieving readers. The advantage of CORI occurred for both low-achieving and high-achieving students.

Consistent with recommendations from the meta-analysis reported by Swanson (1999), the instructional approach for comprehension included teacher modeling, scaffolding, and guided practice in small groups. In addition, CORI students participated in other whole class instruction activities that were included in the CORI model for both high-achieving and low-achieving students. Recent investigations attempting to increase specific reading comprehension strategies in low-achieving readers have found that strategies such as finding the main idea (Mason, 2004) or identifying text structure (Williams, 2003) can be effectively taught to students with reading disabilities. Prior studies have also shown that authentic purposes for reading, and texts combined with

explicit teaching of comprehension can increase certain measures of informational text comprehension (Purcell-Gates et al., 2007) for students in grades 2 and 3. However, neither of those investigations reported an instructional effect on a standardized reading comprehension test. This study contributes to the literature by showing that comprehension gains on a standardized test of reading comprehension, such as the Gates-MacGinitie Reading Test (2000), can be observed for both low-achieving and high-achieving students as a consequence of integrated, comprehensive instruction.

This investigation found that integrated comprehensive instruction in the form of CORI enabled students to acquire word recognition. CORI students surpassed traditional instruction students on a measure of word recognition speed, consisting of reading single words in isolation as rapidly as possible. The increases were substantial with low-achieving CORI students increasing from approximately 62 words per minute in the pretest to 81 words per minute in the posttest whereas the low-achieving TI students did not increase significantly. The high-achieving CORI students also increased in word recognition speed from a pretest level of 93 words per minute to a posttest level of 101 words per minute. It is evident that both the low-achieving and high-achieving CORI students increased their word recognition level.

In this version of CORI, ecological knowledge of animal-plant communities was the conceptual theme. The instructional effect on knowledge in this domain was substantial, with CORI students significantly higher in the posttest of ecology knowledge than the traditional instruction group. Low-achieving and high-achieving students receiving CORI instruction improved substantially, whereas both groups of students in traditional instruction increased, but only slightly. This result confirms investigations by

Romance and Vitale (2001) showing that reading achievement and science achievement are both increased when instruction in reading and science are integrated. However, previous researchers have not attempted to determine whether the instructional benefits are equal for low-achieving and high-achieving students. CORI teachers expected students to read a substantial number of books on the conceptual theme of ecology and wide reading was encouraged. Consequently, this study contributes to the literature by documenting that science knowledge of low-achieving readers can be increased during reading instruction that includes emphasis on the conceptual theme. It appears that reading instruction can be "concept-oriented," e.g., integrated in a subject-matter discipline, in ways that increase students' conceptual knowledge, as well as increase their word level competency.

On two measures of fluency consisting of the Woodcock Johnson-Fluency and Oral Reading fluency, CORI did not increase performance for higher- or lower-achieving students. These findings do not corroborate the findings from the meta-analysis reported by Chard, Vaughn, and Tyler (2002) showing that fluency increases frequently appear from interventions with repeated reading. Although both the CORI and TI teachers provided repeated reading, choral reading, and expressive reading opportunities for both low-achieving and high-achieving students, these activities consumed only about 10 minutes per day and were secondary to comprehension activities. The results on the inferencing assessment showed CORI with a marginally significant advantage at $p < .07$. Although not statistically significant, this finding suggests that intensifying the inferencing instruction may lead to clear improvements in students' inferencing skills.

With respect to students' motivation, CORI effects on students' motivations were not observed for the measures of self-efficacy, perceived difficulty, enthusiasm, or avoidance in reading. This finding does not concur with previous studies of CORI in which instructional effects on internal motivation variables were observed (Guthrie et al., 2007). However, the motivation measures correlated with the achievement measures consistent with the review by Morgan and Fuchs (2007). In this study, the measure of motivation contained fewer subconstructs and fewer items than measures used in previous studies. Whereas prior studies included intrinsic motivation subconstructs of enjoyment, curiosity, perceived autonomy, and preference for challenge (with multiple items per subconstruct), the measure in this study included only enjoyment and avoidance (its inverse). Likewise, the measure of self-efficacy was abbreviated in this study. These limitations may have led to less valid measures of internal motivation for reading in this investigation, thus reducing its sensitivity to intervention effects.

One potential cost of the integrated model for increasing reading comprehension of low-achieving students was the time required for minimum effectiveness of a unit. That is, an effective unit of CORI for low-achieving students consisted of approximately 30 lessons each lasting 30 minutes, for 6 weeks. Given this time commitment, students were likely to increase in fluency, comprehension processes, topical domain knowledge, and reading motivations. This was longer than the 5 to 15 lessons that are frequently provided in instructional research for low-achieving students on a single component of the reading process, such as fluency or strategies (Gersten et al., 2001). However, if we assume that the typical effective instruction for low-achieving students in research consists of 10 to 15 lessons each for the reading processes consisting of motivation,

knowledge, fluency, inferencing, and comprehension, we have a total of 50 to 75, 30-minute lessons. The 30 lessons in CORI compare favorably to the 50 to 75 lessons that would be required to provide comparable expected benefits across all of the reading processes for instruction that were segmented to specific components and presented sequentially. Although this comparison is not data-based because we did not observe TI for these separate instructional activities, it illustrates that CORI may be time-efficient.

Earlier we stated that the CORI intervention is complex, and this characteristic is double-edged. Although it is valuable to combine multiple components of instructional support for fluency, reading comprehension, content knowledge, and motivation simultaneously, a disadvantage of the model is that it is not possible to identify any single component as the source of students' reading growth. For example, one possibility is that the emphasis on reading fluency within CORI enabled students to comprehend text, gain knowledge, and increase motivation. Although we doubt such an effect, we cannot discount this possibility based on our data. This study did not attempt to disentangle these alternative sources of impact on reading outcomes.

For students at the higher elementary levels who are low-achieving in reading, this study can inform reading instruction. Comprehensive instruction in reading, as illustrated in this study, is consistent with the widely accepted Construction-Integration theory of reading comprehension (Kintsch, 1988). Briefly, the theory states that the surface structure of text is decoded to the oral language system at the word and sentence level; relevant background knowledge is activated, and the two information sources are integrated through inferencing into new resulting knowledge termed the 'situation model.' Cognitive processes of reading comprehension are both 'bottom up,' driven by

word recognition, and 'top down,' driven by content knowledge. It appears that although instruction in word recognition skills is necessary for disabled readers, instruction with a content emphasis facilitates comprehension and additionally facilitates word-level competencies. When students are taught to ask and answer questions on information text, infer relations between sentences, draw concept maps based on text, and explain key concepts in text, they must process multiple new words deeply. Repeatedly requiring decoding, semantics, syntactic relations, and content-based reasoning, these processes are likely to impact word recognition, sentence comprehension, and conceptual knowledge acquisition. This study suggests that lower-achieving readers as well as higher-achieving readers can perform these operations productively when they are provided the appropriate texts.

There are several constraints to the conclusions in this study. The students were in Grade 5, and this combination of instructional components may not be expected to have similar effects on students at another grade level, for example, first grade. The low-achieving students in this study for CORI and TI were below 4.0 grade equivalent at the beginning of Grade 5, but they were not below 2.0 grade equivalent in reading comprehension. Thus, they were not severely disabled according to some criteria, although they were clearly at risk for low achievement in reading, and in other school subjects. The low-achieving groups had a mean of more than one or more years behind grade level, and the groups included a substantial proportion of students who were two or more years behind grade level, which is clearly struggling and may be considered "disabled" according to some criteria at the Grade 5 level. The higher-achieving groups had a mean of more than one year above grade level in reading comprehension which

included some students in both CORI and TI classrooms in the category of "gifted and talented" students. Thus, it is reasonable to term the lower group "low-achieving" in both CORI and TI, and to term the more advanced group "high achieving" in both instructional groups.

The students in the study did not come from classrooms with high proportions (more than 50%) of Special Education students, or classrooms with high proportions of ELL students. The conclusions are restricted to classrooms with less than a majority of Special Education and/or ELL students. In addition, without the CORI professional development previously described, it is unlikely that the teachers could provide this instruction easily. It is unknown whether the instructional effects would appear with shorter time intervals than CORI's 12-week instructional period.

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Appendix A
Reading Motivation Scale

Reading Self-Efficacy: (α = .71)
2. Do you need extra help in reading?*
10. Can you sound out long words?
12. Do you learn more from reading than most students in the class?
18. Can you recognize words easily when you read?
19. Do you think you will do well in reading next year?
24. Are you good at remembering words?
28. Do hard words in a story stop you from reading?*

Perceived Difficulty (α = .76)
3. Are you a good reader?*
4. Can you figure out hard words when reading?*
6. Is it hard for you to understand stories you read in class?
11. Do you make lots of mistakes in reading?
13. Are the books you read in class too difficult?
16. Do you feel others are smarter than you in reading?
21. Is reading to the class a challenge for you?

Intrinsic Motivation(α = .83)
1. Do you enjoy reading books in your free time?
5. Do you like to read new books?
8. Is reading boring to you?*
15. Do you enjoy the challenge of reading a book?
20. Do you enjoy reading interesting books even if they are hard?
22. Do you enjoy reading books for a long period of time?
27. Do you like it when books make you think?

Avoidance (α = .824, .809)
7. Do you guess a lot when reading so you can finish quickly?
9. Do you read easier books so you don't have to work as much?
14. How often do you try to find a good book?*
17. How often do you think, "I don't want to read this."?
23. Do you try to get out of reading books for school?
25. Do you wish you didn't have to read for school?
26. Do you read as little as possible?

* "Negative" question

Appendix B

TITLE	AUTHOR
A Tidal Pool	Philip Steele
Animal Families: Prairie Dogs	Jen Green
Animals in Danger	M. Berger
Can Kids Save the Earth?	M. Berger
Coral Reefs	Katy Pike & Garda Turner
Crab Moon	Ruth Horowitz
Grasslands: A closer look	Susie Behar
Let's Take a Field Trip to an Ant Colony	Kathy Furgang
Life on the African Savannah	M. Berger
Life Processes: Food Chains and Webs	Holly Wallace
Natural World: Wolf	Michael Leach
Oceans	Neil Morris
Our World Our Future: Protecting Forests	Sharon Dalgleish
Partners & Rivals	R. & J. Spilsbury
Partners Under the Sea	Lynn M. Stone
Rainforests	Jane Parker
Termite	Hartley, Macro & Taylor
The Secret World of Ants	Theresa Greenaway
Unusual Friendships	Larry Dane Brimner
What is a Rodent?	Bobbie Kalman

TITLE	AUTHOR
A Colony of Ants	R. & L. Spilsbury
A Colony of Bees	R. & J. Spilsbury
Animal Marvels: Living Together	Gareth Stevens Publishing
At Home in the Tidepool	A. Wright & M. Peck
Horseshoe Crabs Booklet	CORI Booklet

Horseshoe Crabs and Shorebirds	Victoria Crenson
Insect Societies	Jen Green
Native American Animal Stories	J. Bruchac
Parasites & Partners: Breeders	Ben Hoare
Parasites & Partners: Lodgers and Cleaners	Bridget Giles
Perfect Partners	John Woodward
Pollination	Mary Hoff
Symbiosis	Alvin Silverstein
The Secret World of Bees	Malcolm Penny
Threatened Habitats	Uma Sachidhanandam
What is a Biome?	Bobbie Kalman

BOOK SELECTION

Grade 5 CORI

"Interdependency of Life in Communities" Information Texts

Class sets
Team sets

Expressive Literature Texts

Class Sets

TITLE	AUTHOR
Beast Feast	Douglas Florian
Food Chain Frenzy: The Magic School Bus	Anne Capeci
In One Tidepool	Anthony D. Fredericks
Julie of the Wolves	Jean Craighead George
Native American Animal Stories	M. Caduto & J. Bruchac
The Queen Bee	Brothers Grimm

Teacher's Guide

Keepers of the Animals: Native American Animal Stories	M. Caduto & J. Bruchac

Struggling Reader Texts

Team Sets

TITLE	AUTHOR
Animals in Danger	Amos
Ant Cities	Arthur Dorros
Ants, Ants, Ants	John Sheridan
Bees	Larry Dane Brimner
Grasslands	Darlene R. Stille
Horseshoe Crabs	Lola M. Schaefer
How Ants Live	John Sheridan
Inside an Ant Colony	Allan Fowler
Living Together	Jo Windsor
Monarch Butterflies	Laura H. Waxman
Oceans: A True Book	Darlene R. Stille
Sea Anemones: Science Under the Sea	Lynn M. Stone
Temperate Forests	Sally Wilkins
The Bee	Sabrina Crewe
Tropical Rain Forest	Darlene R. Stille
Weird Friends	J. Aruego & A. Dewey
Who Eats What?	Patricia Lauber
Wolves	Otto

Individual Texts

TITLE	AUTHOR
Animals of the Grasslands	S. Savage
Barnacles	Lola M. Schaefer
Endangered Grassland Animals	D. Taylor

Extraordinary Horseshoe Crabs	Julie Dunlap
Friendships in Nature	Hines
Incredible Insects: Bees	James E. Gerholdt
Life Cycle of a Monarch Butterfly	Jason Cooper
NOVA: Little Creatures Who Run the World	

Birdbrain Amos	Michael Delaney
Insect Invaders: The Magic School Bus	Anne Capeci
Judy Moody Saves the World!	Megan McDonald
One Day in the Alpine Tundra	Jean C. George
The Box Car Children: The Honeybee Mystery	Gerttrude C. Warner
Child of the Wolves	Elizabeth Hall
Julie	Jean C. George
Mysteries in Our National Parks: Wolf Stalker	Skurzynski & Ferguson
Seasons of the Moon: Autumn Moon	Jean C. George
Seasons of the Moon: Spring Moon	Jean C. George
Seasons of the Moon: Summer Moon	Jean C. George
Seasons of the Moon: Winter Moon	Jean C. George
Song of the Trees	Mildred D. Taylor
The Case of the Missing Cutthroats	Jean C. George
The Music of Dolphins	Karen Hesse
A Hive for the Honeybee	Soinbhe Lally
Dipper of Copper Creek	Jean C. George
Frightful's Mountain	Jean C. George
Green Thumb	Rob Thomas
Island of the Blue Dolphins	Scott O'Dell
Return of the Wolf	Dorothy H. Patent
The Water Babies (British version)	Charles Kingsley
Wild Man Island	Will Hobbs

NOVA: Tales From the Hive	
Parasites & Partners: Farmers and Slavers	Amanda Harman
Parasites & Partners: Feeders	Rob Houston
Parasites & Partners: Hitchers and Thieves	Kieren Pitts
Parasites & Partners: Killers	James W.R. Martin
Peterson Field Guides: Atlantic Seashore	Kenneth L. Gosner
Secrets of the Rainforest: Partners and Parents	Michael Chinery
Sea Anemones	Lola M. Schaefer
Sea Snails: Science Under the Sea	Lynn M. Stone
Sponges: Science Under the Sea	Lynn M. Stone
The Life and Times of the Honeybee	Charles Micucci
The Magic School Bus: Inside a Beehive	J. Cole & B. Degen
What are Food Chains and Webs?	Bobbie Kalman
World of Wonder: Living Together	Mary Hoff

Book Club novels (6 novel titles for per class.)
Team Sets

Supplemental Struggling Readers
Team Sets

Animals are Everywhere	Stamper
Night Animal, Day Animal	Lechner
Bringing the Sea Back Home	Lawrence
Ocean Life Tide Pool Creatures	Leonhardt
Over in the Ocean in a Coral Reef	Berkes
What About Oceans	Palmer
Hairy Little Critters	Wilde
Amazing Ants	Whiting
The Ant and the Grasshopper	Alexander
Insect Lives	Berger
The Bug and the Bird	Schreiber
Bug-head and Me	Shipton
Insects	Pike
Those Tricky Animals	Vaughan
Prowling Wolves	George
Wolves	Economos
Animals Sensors	Pyers
The Polar Bar and the Jaguar	Collard III
Nature's Patterns	Edwards
Strange Animals	O'Sullivan
Animals of the Ice and Snow	Gordon
A Rain Forest Day	Nayer
Rain Forest Adventure	Thompson
Winter Survival	Wilde
Animals in Danger	Thompson
Bushfire in the Koala Reserve	Tidey
Inside a Rain Forest	Thompson
In the Rain Forest	Rice
Saving Our Animals	Goodman
Owen Foote, Mighty Scientist	Greene
The White Wolf	Roy
The Wolves' Winter	Pernick

Table 1

Demographic Characteristics of Participants in CORI and TI

Percentages	CORI-Low	CORI-High	TI-Low	TI-High
Gender				
Male	48.8	39.6	63.6	65.0
Ethnicity				
African American	37	17	27	17
Asian	0	2	0	3
Caucasian	42	56	63	77
Hispanic	15	4	9	3
Other	2	4	0	0
ELL				
Yes	0	12	02	14
Special Education				
Yes	2	8	0	23

Table 2

Numbers of ESL Students and Achievement Levels on Gates- MacGinitie in September

		ELL			Total		
Inst. Gp.	Ach. Gp.	*N*	*M*	*SEM*	*N*	*M*	*SEM*
CORI	High	0	--	--	53	6.76	.20
CORI	Low	5	2.94	.65	41	3.11	.22
TI	High	1	5.10	1.44	40	6.20	.23
TI	Low	3	2.70	.83	22	2.92	.31

Note: Scores in *M* column are means of GM grade equivalent. *SEM* is standard error of measurement.

Table 3

Post-test Scores for Reading Among Low and High Achievers in CORI and TI

	CORI				Traditional Instruction (TI)			
	Low		High		Low		High	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gates-MacGinitie	476.72	11.10	528.57	16.50	459.03	15.72	514.23	8.75
Ecological knowledge	11.40	3.04	15.17	1.10	5.83	1.17	8.37	1.27
Inferencing	8.88	.68	9.58	.82	7.73	1.30	9.67	.32
Word recognition	80.63	5.95	101.40	9.51	63.55	26.66	89.83	10.45
W. Johnson Fluency*	94.44	5.00	111.33	6.74	91.83	5.99	110.07	3.96
Oral rdg. Fluency	14.97	1.75	17.83	1.39	13.33	1.70	17.47	.40

*W. Johnson Fluency = Woodcock Johnson Fluency

Table 4

Pretest Scores for Reading Among Low and High Achievers in CORI and TI

	CORI				Traditional Instruction (TI)			
	Low		High		Low		High	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Gates-MacGinitie	455.54	9.71	515.33	15.58	450.70	3.69	509.13	1.36
Ecological knowledge	7.12	2.23	9.60	1.25	4.50	.75	7.90	1.21
Inferencing	8.00	.46	8.77	1.53	7.97	.58	9.03	.55
Word recognition	61.97	5.59	93.23	13.45	67.97	13.97	85.27	11.74
W. Johnson Fluency*	91.60	3.19	104.30	7.72	91.80	1.21	104.00	2.76
Oral rdg. Fluency	11.32	1.86	16.67	2.07	11.70	.30	16.97	2.02

*W. Johnson Fluency = Woodcock Johnson Fluency

Table 5

Correlations of Reading Motivations with Reading Skills Post Scores

	1	2	3	4	5	6	7	8	9
1. Gates-MacGinitie									
2. Ecological knowledge	.71**								
3. Infer-encing	.78**	.51*							
4. W.Johnson Fluency	.93**	.62**	.68**						
5. Word recognition	.87**	.77**	.79**	.81**					
6. Oral rdg. fluency	.85**	.69**	.81**	81**	81**				
7. Self-Efficacy	.47*	.20	.31	.53*	.44	.46			
8. Perceived difficulty	-85**	-.50*	-69**	-81**	-69**	-87**	-.64**		
9. Intrinsic motivation	.55*	.31	.28	.58*	.36	.60*	.55*	-79**	
10.Avoidance	-76**	-61**	-69**	-66**	-77**	-66**	-.39	.72**	-.62**

Note: $^{**}p < .01$; $^{*}p < .05$

Table 6

Correlations of Reading Scores for Pre- and Post- Assessments

Pretest	1	2	3	4	5	6	7	8	9	10	11	12
1. Gates-MacGinitie												
2. Ecol. knowledge	.71**											
3. Infer-encing	.78**	.51*										
4.W. J. Fluency	.93**	.62**	.68**									
5. Word recognition	.87**	.77**	.79**	.81**								
6. Oral Rdg. Flu.	.85**	.69**	81**	81**	81**							
Posttest												
7. Gates-MacGinitie	.95**	.58*	.70**	.92**	.74**	.87**						
8. Ecol. knowledge	.85**	.83**	.71**	.79**	.89**	.86**	.76**					
9. Infer-encing	.57*	.22	.72**	.53*	.41	.62**	.63**	.47				
10. W. J. Fluency	.87**	.49*	.67**	.92**	.67**	.80**	.93**	.71**	.78**			
11. Word recognition	.87**	.66**	.56*	.91**	.80**	.67**	.81**	.78**	.42	.80**		
12. Oral rdg. Flu.	.82**	.55*	.55*	.85**	.65**	.76**	.85**	.76**	.47	.80**	.86**	

Note: $^{**}p < .01$; $^{*}p < .05$