Influences of Concept-Oriented Reading Instruction on Strategy Use and Conceptual Learning from Text

John T. Guthrie
Emily Anderson
Solomon Alao
Jennifer Rinehart
University of Maryland

Abstract

We define reading engagement as the mutual support of motivations, strategies, and conceptual knowledge during reading. To increase reading engagement, a collaborative team of teachers, reading specialists, and university faculty implemented a year-long integration of reading/language arts and science instruction known as Concept-Oriented Reading Instruction (CORI). This instruction contained conceptual themes, real world science interactions, self-directed learning, strategy instruction situated within conceptual contexts, peer collaborations, self-expression of knowledge through portfolios and exhibits, and coherence of the curriculum. Five teachers provided CORI to 53 grade 5 and 67 grade 3 students. 5 teachers provided traditionally organized instruction aimed toward the same objectives to 53 grade 5 and 66 grade 3 students. Students were from 2 low-income schools. The CORI context increased strategy use, conceptual learning, and text comprehension more than traditional instruction, when background was controlled. Principles of contexts for engagement are discussed.

In this study we examined the effects of Concept-Oriented Reading Instruction (CORI) on reading engagement. We first define reading engagement as the joint operation of motivations, strategies for reading, and conceptual knowledge acquisition during reading. Next, we briefly describe our rationale for adopting reading engagement as an aim of instruction. Then we describe CORI, which is our instructional framework for enhancing reading engagement. This framework contains seven principles; each is defined, described, and exemplified. Next, we present a quasi-experiment in which a week-long performance assessment was used to compare students in this program with students in traditionally orga-

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nized classrooms on strategy use, conceptual knowledge, and transfer.

A Formulation of Reading Engagement

Engagement in reading refers to the joint functioning of motivations and strategies as students construct conceptual knowledge during reading. These processes operate dynamically, increasing over time. The engaged reader is in a continual process of activating and extending her conceptual understanding. As she reads, she acquires core knowledge that lies at the heart of the domain represented in the text (Alexander, Schallert, & Hare, 1991; Chi, DeLeeuw, Chiu, & Lavancher, 1994).

Engaged readers use and regulate strategies to enhance their conceptual understanding. Using prior knowledge (Anderson & Pearson, 1984) and posing questions to themselves, engaged readers are involved in a process of searching (Singer & Donlan, 1982). They search through multiple texts and extract critical details (Guthrie, Weber, & Kimmerly, 1993). As engaged readers succeed in searching, they use strategies for integrating information (Dole, Duffy, Roehler, & Pearson, 1991) from expository and narrative texts (Graesser, Golding, & Long, 1991). Engaged learners also use strategies for communicating and representing their understanding, which may entail drawing, charting, note taking, and composing, either in narrative, expository, or persuasive rhetorical structures (Flower et al., 1990; Harris & Graham, 1992).

Learning these strategies for searching, comprehending, and composing requires the motivational attributes of attention, effort, and desire to understand (Dweck & Leggett, 1988; Nicholls, 1984; Pintrich & Schrauben, 1992). Meece, Blumenfeld, and Hoyle (1988) showed that task mastery goals, which refer to the desire to learn the content of a lesson or unit fully, predicted the self-reported use of such learning strategies as self-questioning, self-monitoring, and integrating new information with prior knowledge. Guthrie et al. (1996) reported that intrinsic motivations for reading gathered through an in-depth interview correlated highly (.8 for grade 5, and .7 for grade 3) with students' searching, extracting, and integrating as they studied multiple texts and illustrations. Pintrich and DeGroot (1990) found that intrinsic value (interest in a course topic) predicted the availability and self-regulation of cognitive strategies including goal setting, self-monitoring, and summarizing. Motivation to learn about a topic also contributes to conceptual understanding. Schiefele (1996) and Grolnick and Ryan (1987) showed that an interesting topic that was stimulating and involving was understood more meaningfully than a topic that was uninteresting, after prior knowledge was controlled.

Motivations for reading in a multitext classroom environment are multifaceted. Using a combination of methods, including an open-ended interview with students, self-report questionnaires, and video-prompted interviews, Wigfield and Guthrie (1997) and Guthrie et al. (1996) have identified a variety of motivations for reading, including curiosity (the desire to learn about one's world through reading, writing, discussing, or viewing); aesthetic involvement (the goal of experiencing beauty through language or art); social interaction (the desire to relate to other individuals on a personal level as well as an academic level); challenge (activities that are important and at an optimal level of difficulty); and self-efficacy (self-perception of competence and capability). These motivations have been found to predict amount of reading, cognitive strategies, and volitional strategies (Guthrie et al., 1996; Wigfield & Guthrie, 1997). The more performance-oriented goals of recognition, competition, and grades lead to more superficial learning and less conceptual understanding than the more mastery-oriented intrinsic goals (Graham & Golan, 1991; Pintrich & Schrauben, 1992).

Rationale for Reading Engagement as an Instructional Aim

Reading engagement should be the aim of instruction for several reasons. First, reading achievement depends on amount and breadth of reading (Cunningham & Stanovich, 1991), which is highly associated with intrinsic motivation (Wigfield & Guthrie, 1997). Second, reading achievement requires cognitive skills of word recognition, text comprehension, inferencing, summarizing, and self-monitoring (Barr, Kamil, Mosenthal, & Pearson, 1991). In addition, mastery goals and intrinsic motivational goals are invaluable complements to these cognitive aims. Motivational goals will not only facilitate reading achievement in the short term, but intrinsic motivational goals are essential to long-term, self-determined reading (Guthrie, Schafer, Wang, & Afflerbach, 1995; Linn & Muilenburg, 1996; Oldfather & Wigfield, 1996).

Principles of Concept-Oriented Reading Instruction

The purpose of CORI is to optimize the development of reading engagement. In this study, the instructional goal was to create classroom environments that facilitated long-term, generalized engagement in reading. That is, CORI was expected to enable students to approach new learning situations with more motivated strategy use than students who had not experienced the instruction. A team of teachers, university faculty, and students generated a set of classroom characteristics intended to accomplish this goal and implemented them in a year-long curriculum. The characteristics of CORI, outlined next, are presented in a more elaborated form elsewhere (Guthrie & Alao, 1997).

Conceptual Theme

The CORI classrooms were organized around broad, interdisciplinary themes enabling students to gain a conceptual understanding that was flexible, transferrable, and informed by multiple genres. A conceptual theme refers to a set of principles that defines a knowledge domain (Alexander, 1992) and can be understood through multiple texts and genres (Hartman, 1995). Examples of conceptual themes are adaptation in life science, or structure and formation of features of the earth, such as mountains and rivers, in earth science. Conceptual learning includes several types of acquisition consisting of particular features, propositions, and principles in a domain (Chi et al., 1994). Students at the highest level of conceptual learning acquire explanatory principles for phenomena and events (Alexander, Jetton, & Kulikowich, 1996). This knowledge is active and not inert. It can be transferred to new situations to solve problems.

The classroom contexts implementing CORI were conceptually thematic because a substantial number of the activities were directed to understanding and communicating a concept. Strategies were taught for the purpose of understanding the concept. Social interactions were initiated for the purpose of understanding the concept. Group reports were planned and produced to communicate the conceptual theme to other audiences. Reading, writing, and science activities were focused on (literally turned toward) the concept.

Real World Interaction

The CORI classroom contexts provided ample opportunity for direct sensory experiences with phenomena that were relevant to the conceptual theme. Hands-on science activities allowed students to see, hear, feel, smell, and experience events that were conceptually related. For example, in one classroom the students went on a cricket hunt in the backyard of the school. Another class collected materials and built their own bird nests. These activities were designed to support questioning, reading, thinking, and writing about the conceptual theme of adaptation, especially species-biome relationships.

Direct, sensory observations serve two vital purposes in the development of engagement. First, they are exciting. Students are attentive and energized. This arousal is not only enjoyable and entertaining, but this contextualized, situational interest (Linn & Muilenburg, 1996; Schraw, Bruning, & Svoboda, 1995) can be linked to book reading. In these settings, situational interest begins with attention to surface structure of phenomena (e.g., the shapes, colors, and physical structures of things). These situational interests then evolve into long-term, generative, personal interests under supportive classroom conditions. In other words, situational interests can be the basis for long-term mastery orientations and intrinsic motivations for reading, if the context is suitably supportive.

A second purpose of real world interaction linked to the conceptual theme is to provide the opportunity for student questioning. Ross (1988) showed from a meta-analysis of experiments that hands-on activities enhanced the quality and number of questions and the recall of relevant knowledge. According to teachers in this study, students posed an abundance of personal queries that were initially directed to surface structures (e.g., colors, shapes, and sizes of things) but soon became conceptual (e.g., How do spiders find food?). If instruction supports students in answering their conceptual questions, students become engaged. Intrinsic motivational goals of curiosity, involvement, challenge, social interaction, and self-efficacy increase. When students develop a belief in the classroom context (Ford, 1982) as a place where their motivational goals will be fulfilled, they become engaged in reading and learning.

Self-Directed

The classrooms were structured to be autonomy supportive (Deci, Vallerand, Pelletier, & Ryan, 1991). Teachers provided opportunities for student input into the questions that guided teaching. Students set subgoals for their own reading and writing. Students freely chose books for learning, within the conceptual theme, although initially the options were limited. Broader options were constructed as students showed the capacity for a productive use of them. Such supports for student choice in reading and writing are motivating for first graders (Turner, 1995), fifth and sixth graders (Skinner & Belmont, 1993; Sweet, Guthrie, & Ng, 1998), and college students (Pintrich & Schrauben, 1992).

The nature of autonomy support is crucial. Students will feel demeaned and demoralized if they cannot exercise a choice, if the choice is trivial, if the choice cannot be made on an informed basis, or if the choice is hypothetical. Too much choice, however, can be confusing and disengaging. In CORI, autonomy support was directed to: (*a*) conceptually significant issues, (*b*) avenues for learning that are meaningful (e.g., book reading vs. a computer search in a 2-day period), and (*c*) alternatives for expressing knowledge that had visible consequences (e.g., writing a poster vs. writing an informational story). Although the pedagogical principle of providing choices (Ames, 1992; Paris & Turner, 1994) is widely accepted, the particulars of these options are vital.

Collaboration

The CORI teachers supported students in working together toward understanding the conceptual theme, gaining cognitive strategies, and learning how to communicate effectively in groups. Students participated in varied social structures that included individual work, partnerships, small teams, and whole-class activities. Two prominent formats were literature circles, in which groups form an interpretation of literary work (Almasi, 1995), and idea circles, in which students pool diverse information sources to gain conceptual understanding from multiple texts (Guthrie & McCann, 1996).

Hundreds of studies have been done to examine various forms of cooperative learning. Among the most widely researched variables is positive group interdependence (Johnson, Johnson, & Stanne, 1989; Smith, 1991). This construct characterizes groups in which students must coordinate their efforts, share information, contribute specialized expertise, and build on each other's thinking. When members complete separate subtasks individually, student achievement is increased (Sharan & Sharan, 1992) and intrinsic motivation is enhanced (Ng, Guthrie, McCann, Van Meter, & Alao, 1996). Furthermore, when a group of students adopts a common set of goals that involve conceptual learning, students are superior in learning science concepts and strategies for reading (Meloth & Deering, 1994). In addition, interpersonal skills, such as listening, taking turns, speaking in a suitable voice, and encouraging full participation, can be encouraged, which enhances the productivity and enjoyment of group work (Almasi, 1995; Johnson et al., 1989). Collaboration in CORI was consistent with these findings.

Strategic

Teachers provided the support students needed to acquire strategies for learning and expressing conceptual knowledge through a variety of genres. Strategies for reading included using prior knowledge (Anderson & Pearson, 1984), searching for information (Guthrie et al., 1993), comprehending informational text (Dole et al., 1991), interpreting literary text (Graesser et al., 1991), and self-monitoring (Baker & Brown, 1984). Teachers coached the students in learning these strategies. First, teachers appraised students' strategy knowledge level and then provided modeling, small-group discussion, peer modeling, whole-class discussion, and individual self-evaluation depending on how much explicitness students required.

Strategies for writing were taught, including brainstorming, planning, drafting, revising, and self-regulating (as described by Harris & Graham [1996]). Grade 5 students were taught a wider range of writing strategies than grade 3 students, including rhetorical structures for persuasion, informational narratives, and expository texts (Flower et al., 1990). These strategies were also taught through modeling, small-group discussion, guided practice, and revision that led to publication in the classroom.

Strategies for reading and writing are difficult to learn and use. Many investigators report that strategies require long-term teaching (Gaskins & Elliot, 1991) and once learned, strategies may not be frequently used (Brown, 1992). Consequently, students must be intentional (Bereiter & Scardamalia, 1989), wanting to learn the content for which the strategies will be useful. In reading, intrinsic motivations are vital to strategy learning. Guthrie et al. (1996) found that all students who increased in intrinsic motivation during a year increased in strategy use. However, only 50% of the students who were stable or declined in intrinsic motivation increased in strategy use. Consequently, CORI teachers situated strategy learning in the contexts of the conceptual theme, real world experience, social collaboration, and self-expression. These contexts enhanced the intrinsic motivation for complex strategy development.

Self-Expression

Students in CORI classrooms were supported in articulating their understanding of the conceptual theme to audiences that were personally and culturally relevant to them. Forms of expression included written reports, performances, posters, videos, peer teaching, poetry, and stories. Students' expressions are self-referenced when students take responsibility for selecting the topic and/or the form of communication. Building the communication of their knowledge on their own interests, students can combine their personal orientations with academic learning.

Several classroom characteristics contribute to self-expressive quality. Teachers must provide ample time for students to think, plan, write, and revise (Oldfather & McLaughlin, 1993). Writing activities that invite a wide range of alternative genres and topics are more motivating than activities that are highly defined and constrained (Turner, 1995). If students are empowered to be self-expressive, they view all knowledge as contextual, experience themselves as creators of knowledge, and value both subjective and objective strategies for knowing (Belenky, Clinchy, Goldberger, & Tarule, 1986). The CORI classroom contexts contained the expectation that students would define the topic, the form of the text, the audience, and the collaborative structures for communicating their understanding of the conceptual theme to others.

Coherence

Teachers created coherence by linking the activities, materials, and contexts that enabled students to make connections. By doing so, teachers enabled students to perceive the connections among (*a*) real world experience and reading, (*b*) strategies and content about a particular topic, and (*c*) scientific and literary texts. The purpose for bringing coherence into the instruction was to enhance the integration of the processes of reading engagement (e.g., the motivations, strategies, and use of knowledge). As Lipson, Valencia, Wixson, and Peters (1993) reported, and as Pate, McGinnis, and Homstead (1995) suggested, the rationale for integrated instruction is usually to enhance the learning of content and metacognitive strategies. They noted also that coherence (or integration of the curriculum) provides a more interesting, meaningful way to teach and attain the main goals of the curriculum. Although relatively few empirical studies have been conducted to examine whether varying degrees of coherence benefit students, a number of educational researchers (Brophy & Alleman, 1991) and curriculum specialists (Beane, 1995) advocate coherence.

Purposes of Study

Reading engagement refers to the joint functioning of motivations, strategies, and conceptual knowledge in extended text interactions. In an attempt to increase elementary students' reading engagement, a team of university faculty, students, and teachers collaborated to construct classrooms that could be portrayed in terms of the following seven dimensions: (1) conceptual theme, (2) real world experience, (3) self-direction, (4) strategy instruction, (5) collaboration, (6) self-expression, and (7) coherence.

One goal associated with this study was to determine whether students in CORI classrooms increased their literacy engagement and conceptual learning. Development of reading engagement within a domain of knowledge has been shown (Guthrie et al., 1998). If students are intrinsically motivated to gain conceptual knowledge through text, they will display their motivations and strategies in a new subject matter. If students' motivations and strategies (e.g., engagement) are increased in the domain in which they are taught, the engagement is valuable, but restricted. In contrast, if the students' engagement generalizes, they will be interested and will use effective strategies in learning a new domain. In this study, CORI students and traditional students were given a performance assessment in two knowledge domains. One was the familiar domain of life science (e.g., biome-species relationships in ponds and deserts) in which they had extensive instruction. The other was a new domain of earth science (e.g., features and formations of volcanos and rivers). If the benefits of CORI are evident in the new as well as the old knowledge domain, a generalized reading engagement has been acquired because of the instruction. To examine this possibility, CORI students were compared to traditional students taught by comparable teachers in the same schools. Consequently, the two questions that guided this study were, To what extent does CORI increase conceptual learning from text in familiar and new knowledge domains? and, To what extent does CORI increase motivated strategy use in reading in familiar and new knowledge domains?

Method

Participants

Teachers and schools. Three schools bordering a large, mid-Atlantic state metropolis participated in this study. Each school had a multicultural population that was approximately 55% African American, 22% Caucasian, 15% Hispanic, and 7% Asian or other. Two of the schools were designated as Chapter 1, and one school had a mainstream program for orthopedically disabled students. The schools were nominated by the district supervisor of reading as likely to benefit from an integrated curriculum for low-achieving students, and the principals were pleased to participate. All participating teachers volunteered for the study and were willing to teach in either CORI or traditional classrooms. The teachers at grades 3 and 5 in each school who were most similar in age, teaching experience, educational background, and management expertise were assigned to CORI and traditional classes. All teachers were between 41 and 50 years in age, had 20–24 years of teaching experience, and had bachelor's degrees plus 45 hours of university credit.

The CORI teachers participated in a summer workshop for 10 half-days to plan instruction for the year. The CORI teachers, two reading specialists (one from each school), one university faculty member, and one university student collaboratively discussed instructional goals, student activities, teaching strategies, and resources (trade books and manipulatives) needed to implement the CORI principles in their classrooms. Then these teachers met 1 full day per month during the school year to discuss progress, challenges, and pedagogical strategies.

Classrooms and students. Third-grade classrooms in all schools were self-contained, with the teacher providing all the instruction for approximately 30 students. In the fifth grade, teachers provided all the instruction except that one period per day students left the classroom for math with another teacher. Due to the transitory population, approximately 53 fifth-grade students (22 girls, 31 boys) in two classrooms from two schools completed the year of CORI and the performance assessment. A total of 53 fifth-grade students (28 girls, 25 boys) from two traditional classrooms within the same schools were the comparison students. On the standardized reading test, the CORI students were higher (M = 42.74) than traditional students (M = 38.27), $t(107) = 2.10$, $p < .038$. A total of 67 third-grade students (31 girls, 36 boys) in three classrooms completed the year of CORI and the performance assessment, and 66 students (28 girls, 38 boys) in traditional third-grade classrooms were used for comparison. There was no significant difference between CORI and traditional students on the standardized test. At each grade level, the proportion of boys and girls in CORI and traditional classrooms was not significantly different, according to chi-square analyses. Students identified as learning disabled, orthopedically handicapped, and emotionally handicapped were included in the instruction and assessments. Low achievers from transitory home backgrounds were also included.

Design

This quasi-experiment consisted of two instructional conditions, CORI and traditionally organized basal and science instruction. The CORI approach was implemented in three third-grade and two fifth-grade classrooms. Traditional classrooms within each school were selected for comparison to the CORI classrooms. These classrooms were selected based on comparable students, teachers, and school settings. The measures of reading engagement and conceptual learning based on a performance assessment were administered to all 10 classrooms during the first half of April 1996. Pretests were standardized reading tests given in October 1995.

Instructional goals. Both the CORI and traditional programs were directed toward identical goals for English/language arts and science. Teachers in traditional classrooms were working toward the same instructional goals as teachers in the CORI classrooms. According to their plans reported at the beginning of the year, their emphasis on the skills of text comprehension, reading and writing multiple genres, and integrating information was equally high. In English/language arts, the objectives consisted of interpreting stories, comprehending expository texts, locating and integrating information from multiple texts, summarizing, self-monitoring, writing personal narratives, composing informational reports, and writing poetry. In science, the common goals included understanding the life cycles of plants and animals, describing important adaptations of animal species, understanding cycles of weather and seasons, collecting data, interpreting graphs and tables, and interpreting data from class-wide projects. More complex higher-order goals were adopted for fifth-grade than for third-grade students. Although the objectives were constant across the classrooms, the methods differed in the CORI and traditional classrooms. The methods were the instructional principles of CORI with trade books in the experimental classrooms. The methods were the basal and science textbook in the traditional classrooms. Instruction was adjusted to meet the needs of all learners, including approximately five students in each grade 3 CORI classroom who entered the year reading at a 1.5 grade level. These adjustments consisted of providing developmentally appropriate texts and evaluating achievement individually in terms of each student's progress.

Concept-oriented reading instruction. The teaching framework for CORI included four phases: (1) observe and personalize, (2) search and retrieve, (3) comprehend and integrate, and (4) communicate to others. To implement this framework, teachers first identified a conceptual theme for instructional units to be taught for 16–18 weeks in the fall and spring. The themes selected by third-grade teachers were the adaptations and habitats of birds and insects for the fall. In the spring, the third-grade units were weather, seasons, and climate. Fifth-grade units in the fall were life cycles of plants and animals, and the spring units emphasized earth science, including the solar system and geological cycles.

At the beginning of each unit, students performed observation and hands-on activities both outside and inside the classroom. Third and fifth graders participated in such activities as collecting and observing crickets, constructing spider webs, dissecting owl pellets, and building weather stations. Within each activity, students personalized their learning by composing their own questions as the basis for observing, reading, and writing. Student questions included a structural focus, such as, "How many types of feathers does a bird have?" Then conceptual questions, such as, "Why does that bird have such a long beak?" evolved as students attempted to explain the phenomena they had observed. These questions generated opportunities for self-directed learning. Students chose their own subtopics, found particular books, selected peers for interest-based activities, and constructed their goals for communicating to others.

The second phase of the CORI framework consisted of searching and retrieving information related to the students' questions. Students were taught how to use the library, find books, locate information within expository texts, and use a diversity of community resources. In addition, direct strategy instruction was provided to help students integrate information across sources including texts, illustrations, references, and human experts. Along with informational texts, woven through the instruction were stories, folklore, novels, and poetry. Most of the teachers began the units with a narrative related to the theme that students read at the same time they were conducting science observations. Following observation and the formation of conceptual questions, teachers moved to informational texts. As students concluded their indepth study of multiple informational texts, teachers introduced novels, novelettes, and poetry related to the conceptual theme of the unit.

The last phase of the CORI framework is communicating to others. Having gained expertise in a particular topic, students were motivated to speak, write, discuss, and display their understanding to other students and adults. In both third- and fifth-grade classrooms, students made posters, wrote classroom books, and composed extended displays of their knowledge. One class made a videotape of its weather unit, providing a lesson on weather prediction and an explanation for the rest of the school.

Traditionally organized instruction. The teachers in the traditional classrooms followed their usual pattern of using the teacher's guide and the sequence of content and activities in the McGraw-Hill basal program for both grades 3 and 5. Students answered the end-of-unit questions and were provided materials that matched their reading levels. Science content in the third- and fifth-grade basal reading classrooms was directed to similar objectives as the CORI classrooms. Topics of adaptation, life cycles, weather and seasons, and solar systems were taught, but Addison-Wesley textbooks and materials were used in all traditional classes. The traditional teachers in all of the schools were frequent visitors to the CORI classrooms, adopting some texts and teaching approaches used in the CORI classrooms. This sharing may have led to an underestimation of the distinctiveness of the CORI program and to a conservative quasi-experimental comparison.

Performance Assessment of Reading/Language Arts

The performance assessment was designed to measure seven aspects of literacy engagement. There were two forms, one on the familiar topic of ponds and deserts and a second on the new topic of volcanoes and rivers. Students at grades 3 and 5 in the two topics were not significantly different on the standardized reading tests. The assessment was administered by the teachers during a 1-week period in each traditional and CORI classroom. All students took the assessment in the same 3-week period at the beginning of April 1996. Students worked approximately 1 hour daily for 5 days. Within each classroom, half of the students were randomly selected to take ponds-deserts and half were assigned to volcanoes-rivers. Both forms of the assessment consisted of a learning context with seven tasks. The assessment was introduced with an observational activity. Students were given a colored picture of a pond with fish, insects, birds, and trees, or a volcano with magma, fissures, and lava flow. With a partner, students discussed all the things they observed in the picture for 5 minutes.

Prior knowledge. After viewing the picture, students worked independently to write their knowledge of the topic before entering the search phase. Students were asked to explain how ponds are different from deserts or how volcanoes are different from rivers. Students were aided in the task by being asked the following: (1) What is a pond like? (2) What is a desert like? (3) How are they different? (4) Explain the differences between volcanoes and rivers. (5) What are their parts? (6) How are they made? (7) How are they different? All students were given sufficient time to finish their writing.

Strategy use. Students were next given an opportunity to search for ideas and information about the topic of the assessment independently. Their task was to explain the differences between ponds and deserts or volcanoes and rivers. Students were given a booklet with 14 sections each containing one to five pages of information. A table of contents, index, and glossary were provided. Four of the sections were not directly relevant to the question and 10 were directly useful. Of the 10 relevant sections, five were appropriate for third-grade students, and five were more likely to be appropriate for fifth-grade students.

Students were given a log to fill out during the search activity. In the log, they were asked to present which section they selected, their reasons for choosing this information, and their notes on what they learned from the section. Students were given an unlimited amount of space to fill out their log. The search took place during a 1-hour period on 2 days, and students were allowed as much time as they thought they needed to complete the activity. Students who finished early were permitted to rest or read a book of their choice.

Drawing. Students were asked to draw a picture independently to show how ponds (or volcanoes) are different from deserts (rivers). Students were asked to label the important parts and were given ample time for the activity.

Writing. After completing the drawing, students were given a writing task with instructions to write an explanation of how ponds (volcanoes) are different from deserts (rivers). Working independently, students were given unlimited time for this activity.

Conceptual transfer. Students were asked to perform a task that required them to transfer their knowledge to solve a new problem. The instructions were as follows: Suppose some people drained all of the water out of a pond for 3 days. What would the pond be like during those 3 days? How would the pond be the same or different from a desert? Please explain your answer.

On the other form, the question was as follows: Suppose a river became as hot as an active volcano for 3 days. What would the river be like during those 3 days? How would the river be the same or different from a volcano? Please explain your answer. Students were not permitted to refer to their previous drawings, writings, or texts. They were given ample time to complete the activity and encouraged to think extensively as they did the activity.

Informational text comprehension. Students were given an expository text containing prose, a diagram, and an illustration. Content domains were either pond/desert or volcano/river. Students read a text on a different subtopic, but in the same general domain as they had read in the measure of strategy use. Students in grade 3 read adaptations from *Frog Babies and How They Grow* (pond/desert) (Taylor & Burton, 1991) or *We Need Clean Rivers* (volcano/river) (Carlisle & Carlisle, 1982). Students in grade 5 read adaptations from *Frogs and How They Live* (pond/desert) (Taylor & Greenaway, 1992) and *The Frozen Landscape* (volcano/river) (Lyle, 1991). Each text was approximately 400 words. This task contained one, shorter text rather than the multiple, longer texts of the strategy-use task. Students were given instructions to read this material and answer four questions. The first question (for pond/desert) was, "Describe the differences between a tadpole and a grown-up frog." This required students to integrate information across all three forms of information in the task. The next three questions asked students to address the illustration, the text, and the diagram in that order. Space was given for each answer separately. For the illustration, the question was, "How many pods does a frog have?" For the text, the question was, "What happens to the tail as the frog baby grows?" For the diagram, the question was, "At what stage of life does the frog gain front legs?"

Narrative interpretation. At this stage, students were provided a complete narrative of approximately 1,000 words. Content domains were either pond/desert or volcano/river. Grade 3 students read *The Caterpillar and the Polliwog* (pond/desert) (Kent, 1985) and *Moonlight on the River* (volcano/river) (Kovacs, 1993), and grade 5 students read *The Earth on Turtle's Back* (pond/desert) (Caduto & Brwchac, 1991) and *Letting Swift River Go* (volcano/river) (Yolen, 1992).

Students answered three questions, the first addressing recall of a particular event, the second addressing the author(s)'s perspective on one character, and the third addressing the theme of the literary selection.

Performance Assessment Coding Rubrics

Coding rubrics were used to classify the students' responses on each performance assessment task. The rubric used was adapted from a previous investigation to code pond-desert data (Guthrie et al., 1996) and was extended to include the volcano-river topic. It is provided below.

Writing. Initially this rubric was based on the writing task, but it was also used for coding responses on the prior knowledge, drawing, and conceptual transfer tasks.

Level 1: Student presents (*a*) no information, (*b*) no clear distinction between the objects of pond-desert or volcano-river, (*c*) scientifically inaccurate information, (*d*) one appropriately identified feature, structure, or function for both systems (e.g., fish-cactus for pond and desert or lava-delta for volcano and river), or (*e*) two features, structures, or functions for one object, but not both (e.g., lizards live in the desert, or rivers have fish and come from streams).

Level 2: Student presents a combination of two to four physical features or functions of both of the systems (e.g., water, fish, cactuses, lizards; or streams, waterfalls, high heat, lava). However, no relationships are presented. Scientifically inaccurate information may be included.

Level 3: Student presents accurate and relevant information on at least four characteristics of one system and at least one characteristic of the other system. Alternatively, students may present several characteristics of one system with relationships between them implicitly illustrated through comparison. No explanatory principles for these relations are present.

Level 4: Student presents several relevant characteristics of at least one system with the relationships described explicitly. However, the relationships are presented only for one system. Explanatory concepts are not included.

Level 5: Student presents multiple characteristics with explicit relations described for both systems. Writing is comparative, or parallel, showing symmetry across systems; however, explicit connections among the characteristics are absent or minimal. Alternatively, students may present a principled (level 6) description of one system, with limited information on the other system.

Level 6: Student clearly states explanatory principles that organize or account for relationships and multiple characteristics in each system fully. For example, for ponds-deserts, students explicate the availability of water, life cycles of plants and animals, biome-species relationships, and interdependence of several species. For volcanoes-rivers, student describes the water cycle, weather, multiple sources, and features and life forms of rivers and distinguishes them from the roles of earth's heat, pressure, magma, surface temperatures, and accumulation of deposits in the formation of volcanoes.

The procedure for establishing interrater agreement was identical for all tasks. Two independent raters coded 25 student responses on a task into the rubric for that task. Exact agreement was computed, to report whether raters concurred on the identical number for a given response. Also computed was the adjacent agreement, in which raters disagreed by one or less on the coding of a response. For writing on the pond/desert task, the exact agreement was 80%, and adjacent agreement was 100%. On the volcano/river task the exact agreement was 84%, and adjacent agreement was 100%. Reliability of the writing could be estimated only by correlating it with the drawing task, which resulted in a correlation of .36 ($p < .002$). The conceptual knowledge construct in the analyses was the writing and drawing combined, and the significant correlation indicated an adequate reliability for purposes of this study.

Drawing. The drawing task was coded according to the same rubric as the writing task, with six levels of performance judged by conceptual knowledge represented. Interrater agreement was documented with the same procedure as the writing task. Exact agreement on the pond/desert task was 76%, and adjacent agreement was 100%. Exact agreement on the volcano/river task was 80%, and adjacent agreement was 100%. As indicated previously, the correlation of drawing and writing, an estimate of reliability for the conceptual knowledge construct, was .36 ($p < .002$).

Prior knowledge. Performance on prior knowledge was rated on the writing rubric. Interrater agreement was examined with the same procedures as used for writing and drawing. For the pond/desert task, exact agreement was 64%, and adjacent agreement was 100%. For the volcano/river task, exact agreement was 48%, and adjacent agreement was 92%. The correlation of .38 ($p < .002$) of prior knowledge and conceptual knowledge indicated that the measure had adequate reliability for purposes of this study.

Transfer. Performance on transfer was rated on the rubric used for writing, and interrater agreement procedures were the same as for writing. For the pond/desert task, exact agreement was 84%, and adjacent agreement was 100%. For the volcano/river task, exact agreement was 76%, and adjacent agreement was 100%. The correlation of .42 ($p < .002$) of transfer and conceptual knowledge indicated that the measure had adequate reliability for purposes of this study.

Strategy use. The search logs were coded to obtain information about level of motivated strategy use. There were four measures: (*a*) number of relevant packets identified, (*b*) content level of notes, (*c*) accuracy of notes (in relation to original text), and (*d*) paraphrasing in notes.

Coding for number of relevant packets (sections of a booklet) was from 1 to 7. A code of 1 = one relevant packet; 2 = two or three relevant packets; 3 = four or five relevant packets; 4 = six or seven relevant packets; 5 = eight, nine, or 10 relevant packets; and 7 = more than 10 packets. If students selected three or more irrelevant packets, the coded score was reduced by one to correct for overselection.

Coding for (*b*), the content of the notes in the logs, was placed into five knowledge levels. Level 1 was no notes, level 2 was given for structural features of the system, level 3 was given for simple relationships of structural features, level 4 was given for the inclusion of principles that subsumed relationships and mentioned features, and level 5 was given for principles that contrasted the two systems (e.g., pond-desert contrasted or volcano-river contrasted). The range of scores for this component was 1–15.

Coding for (*c*), the accuracy of the notes, was conducted by determining whether they reflected the text precisely. If accuracy was high on high-level content (as determined by component *b*) for a given packet, a high score was awarded for that packet. If accuracy was high on low-level content from a given packet, a lower score was awarded for that packet. If accuracy was not high no score was awarded for that packet. The scores on all packets were summed. The range of scores for accuracy was 0–25.

Coding for (*d*), paraphrase, was similar to coding for accuracy. If a student paraphrased well on high-level content for a given packet, a high score was awarded. If a student paraphrased well on low-level content, a low score was awarded for that packet. If the paraphrase was not representative of the text substance, no score was awarded for that packet. The range of scores for paraphrase was 0–28.

The score for data analysis of the strategy-use construct consisted of the sum of the following components: (*a*) number of relevant packets, (*c*) accuracy of notes, and (*d*) paraphrasing in notes. The content component was not included because it was subsumed in the (*c*) accuracy and (*d*) paraphrase components. The range for strategy use was 4–34. The interrater agreement was as follows: pond/desert, exact = 56%, adjacent = 92%; volcano/river, exact = 56%, adjacent = 92%. Reliability can be described from the correlations among the three components, which were: number of relevant packets–notes accuracy = .33 ($p <$ .002), number of relevant packets–notes paraphrase = .24 ($p < .002$), notes accuracy–notes paraphrase = −.57 ($p <$. 002). The negative association of accuracy and paraphrase indicated that students tended to use a strategy of high accuracy or high paraphrase; the composite captured both strategies. Significance of the correlations suggested adequate reliability for this study.

Informational text comprehension. Four questions were asked on each text. The first question (which was the most comprehensive) was coded into three levels: no answer/inaccurate answer, simple answer, or elaborated answer. Simple answers usually consisted of one sentence with a list of attributes of a mature frog, such as, "A frog has four feet, no tail, big eyes, and a long tongue." Elaborated answers contained more relational and explanatory concepts, such as the following: "A tadpole swims with its tail, but a frog has four feet to swim and walk. A frog has big eyes to see insects for food, but a tadpole doesn't. A frog has babies, but a tadpole cannot have baby frogs." Questions 2–4 were coded on two levels: no answer/inaccurate, and acceptable answer. The lowest score was 4 (1 for each question), and the highest was 9 (3 for question 1 and 2 for questions 2–4), yielding a scale of 4–9 for this task. Interrater agreement was examined with the same procedures as writing. For the pond/desert task, grade 3–exact was 92%, and adjacent was 100%; grade 5–exact was 88%, and adjacent was 100%. Reliability of this task as indicated by its correlation with the standardized test of .52 ($p < .002$) was adequate for this study.

Narrative interpretation. The three questions were each coded into two levels: no answer/inaccurate answer or reasonable text-based response, with scores of 1 and 2 assigned to these levels, respectively. This led to a scale of 3–6 for this task. Interrater agreement was examined with the same procedures as writing. For the pond/desert task, grade 3–exact was 88%, and adjacent was 100%; grade 5–exact was 100%. For the volcano/river task, grade 3–exact was 100%; grade 5–exact was 88%, and adjacent was 100%. Reliability of this task as indicated by its correlation with the standardized test of .38 ($p < .002$) was adequate for this study.

Pretest. Standardized reading achievement data were used as covariates to equate students on reading level. Scores on the California Test of Basic Skills, vocabulary and comprehension, were drawn from the cumulative record of grade 3 students. The Metropolitan Achievement Test comprehension section was administered by teachers to the grade 5 students. Both measures were administered in the fall of 1995, and the comprehension test was a statistical control for individual differences.

Instructional Questionnaire and Intervention Check

All of the teachers replied to a 75-item instructional questionnaire designed to represent the similarities and differences of CORI and traditional basal-oriented instruction (see Guthrie et al., 1996). The scales were intended to represent the CORI principles we described earlier, including conceptual theme, real world observation, self-direction, strategy instruction, collaboration, self-expression, and coherence. Each of these seven scales was bipolar. For example, the scale on coherence addressed integration of language arts and science (from more integrated, e.g., CORI-like, to more departmentalized, e.g., traditional). Items were set on a four-point Likert scale. The response choices were: very true of my class, somewhat true of my class, not very true of my class, and not at all true of my class. Reliabilities of the scales were conceptual theme, .89; real world observation, .90; self-direction, .91; strategy instruction, .75; collaboration, .66; self-expression, .47; and coherence, .71. All the CORI teachers were equal to or higher than the median for the whole group on each scale. The traditional teachers were equal to or lower than the whole group on each scale. No CORI teacher was equal to the median on more than two scales, and no traditional teacher was equal to the median on more than two scales. These findings confirm that the CORI teachers were following the principles more fully than the traditional teachers.

To follow up the questionnaires qualitatively, videotape-based interviews were conducted. Three lessons of each teacher were taped during the fall of 1995. Each lesson was selected by the teacher to show her best instruction. Teachers were interviewed as they watched the tape. Although all teachers were interviewed on all principles, each CORI teacher was randomly assigned two principles of instruction (e.g., real world observation and self-direction). The interview was extended on these principles to probe more deeply. The teachers' extent of use and implementation of a principle (e.g., support for self-directed learning) as revealed in the interviews corroborated their questionnaire reports. For example, there was no case in which a teacher reported a low level of emphasis on a certain principle in the interview and a high level in the questionnaire. Their replies confirmed their responses to the questionnaires and verified the soundness of the construct validity of the scales. Although the implementation of CORI varied across the teachers, as evidenced in the videos, these principles were consistently more apparent in CORI classrooms than in the traditional teachers' classrooms.

Results

The descriptive means and standard deviations for the measures in the performance assessment are shown in Table 1. These data provided the basis for Figures 1 and 2, which will be discussed later in this section. Correlations among the dependent variables and the standardized reading test are shown in Table 2. The correlations of the test with measures of conceptual knowledge (drawing and writing), strategy use, and transfer were moderate at .35–.42 ($p < .01$). Due to this association, the three variables were analyzed in a multivariate analysis of covariance (MANCOVA) to determine overall effects. However, since each dependent variable was of interest, univariate analyses of variance (ANOVAs) were also conducted on each separately.

To examine the effects of instruction and grade on strategy use, conceptual knowledge, and transfer simultaneously, while controlling for background variables, a MANCOVA was conducted. The analysis was a 2 (instructional condition) × 2 (grade level) × 2 (knowledge domain) design, with past reading achievement test scores and prior knowledge as covariates. This analysis yielded several significant effects. One effect was a significant interaction of instruction × grade × knowledge domain, $F(3, 202) = 4.47$, $p < .005$. Because other effects were subsumed by this interaction and were followed up by univariate ANOVAs, they are not reported here. Within the MANCOVA, this three-way interaction was found to be significant for strategy use, $F(3, 202) = 4.74$, $p < .03$) and conceptual knowledge, $F(3, 202) = 5.76$, $p < .02$), but it was not significant for transfer. Because the overall MANCOVA produced significant effects, additional univariate ANCOVAs were conducted to probe the effects of instruction on the separate dependent variables more closely. Further, the questions of the study were addressed most directly by these univariate analyses.

Question 1 was, To what extent does CORI increase conceptual learning from text in familiar and new knowledge domains? To address this question, a 2 (instructional type) × 2 (knowledge domain)

TABLE 1. Performance of Students on Performance Assessment Tasks

Student Group	N	Prior Knowledge M	Prior Knowledge SD	Strategy Use M	Strategy Use SD	Draw and Write M	Draw and Write SD	Transfer M	Transfer SD	Information Text M	Information Text SD	Narrative Text M	Narrative Text SD	Standardized Test M	Standardized Test SD
Grade 3:															
Pond/desert:															
CORI	32	3.26	.97	15.76	6.64	11.50	7.46	3.03	1.05	6.28	1.33	6.03	1.73	47.79	25.35
Traditional	28	2.77	.88	13.13	5.92	6.86	5.70	2.83	1.15	5.57	1.64	5.59	1.64	43.32	34.25
Volcano/river:															
CORI	33	3.20	1.07	19.38	7.24	9.36	5.73	2.48	1.13	8.09	1.59	4.76	1.20	53.35	30.29
Traditional	27	2.32	1.35	12.44	5.09	6.00	4.19	2.32	1.16	7.88	1.72	4.00	.87	38.31	35.56
Grade 5:															
Pond/desert:															
CORI	23	3.65	.88	18.00	5.64	14.26	7.59	4.00	1.21	7.92	1.54	5.40	1.34	43.29	11.77
Traditional	24	3.11	.69	16.75	4.34	14.17	6.38	3.25	1.11	7.35	1.54	4.44	1.34	37.46	12.60
Volcano/river:															
CORI	26	3.23	1.01	13.74	5.24	11.92	8.06	3.16	1.68	6.74	1.90	4.96	1.25	42.23	8.99
Traditional	28	2.94	.93	15.55	5.75	7.93	4.14	3.15	1.20	6.37	1.59	5.13	1.51	37.54	10.30

NOTE.—Means are unadjusted for covariates. CORI = Concept-Oriented Reading Instruction.

TABLE 2. Correlations among Dependent Measures and Covariates for all Students

	Standardized Test	Prior Knowledge	Strategy Use	Draw and Write	Transfer	Narrative	Exposition
Standardized test	1.000	**	**	**	**	**	**
Prior knowledge	.332**	1.000	**	**	**	**	**
Strategy use	.286**	.356**	1.000	**	**	*	**
Draw and write	.273**	.384**	.377**	1.000	**	**	**
Transfer	.243**	.354**	.353**	.416**	1.000	**	**
Narrative	.377**	.239**	.197*	.224**	.348**	1.000	**
Exposition	.521**	.355**	.297*	.331**	.229**	.101	1.000

NOTE.—N = 196. One-tailed significance.
*$p > -.01$.
**$p > -.001$.

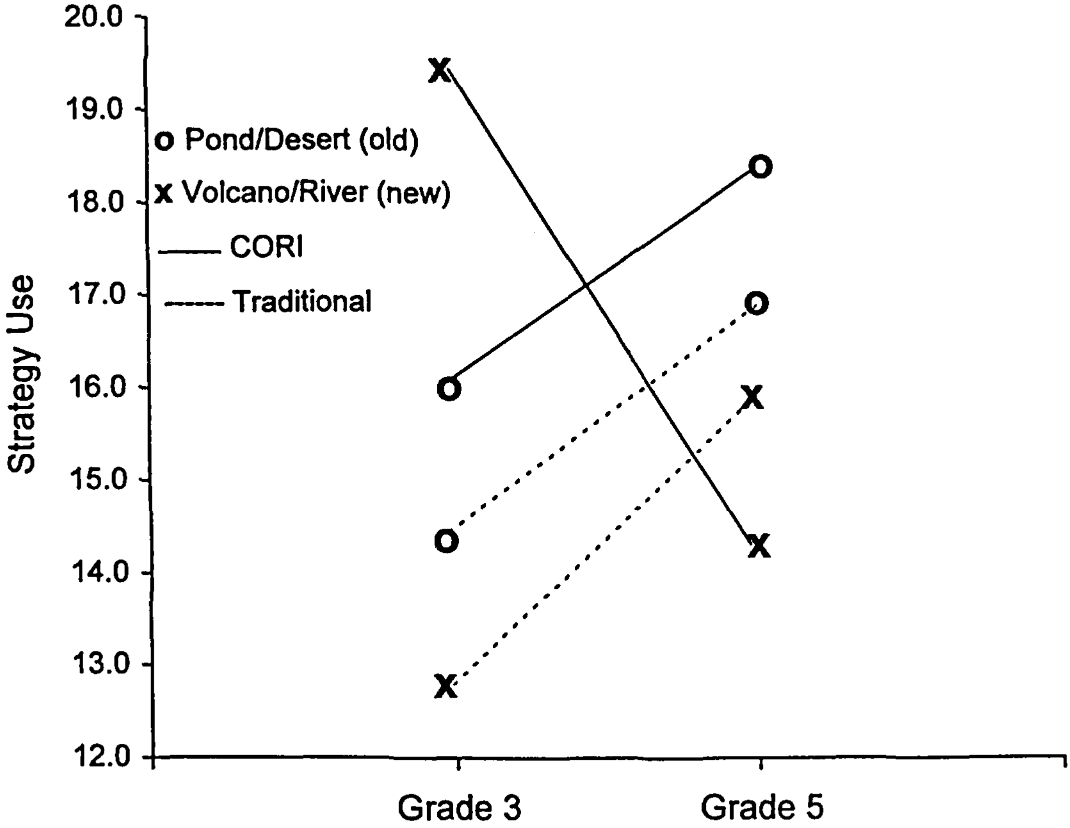

FIG. 1.—Levels of strategy use for Concept-Oriented Reading Instruction (CORI) and traditional students in new (volcano/river) and old (pond/desert) knowledge domains.

× 2 (grade level) ANCOVA was conducted. The dependent variable was the product of the drawing score and the writing score. In our judgment the product represented the students' conceptual knowledge better than the sum of draw and write because the product captured the interaction between text and drawing that some students entered into their responses. The covariates were the standardized reading test score and the prior knowledge score on the performance assessment. The assumption of homogeneity of regression of the covariates and the independent variables was examined with the multiple regression procedure recommended by Pedhazur and Schmelkin (1991). The assumption was met, permitting the use of analysis of covariance. There was a significant main effect for instructional type, with CORI students (M = 11.54) higher than traditional students (M = 8.55), $F(1, 208) = 5.66, p < .02$. There was also a significant main effect for domain, with scores on the pond-desert (M = 11.41) measuring higher than scores on the volcano-river (M = 8.86), $F(1, 208) = 12.26, p < .001$. Finally, there was a significant main effect for grade, with grade 5 (M = 11.90) higher than grade 3 (M = 8.63), $F(1, 208) = 19.35, p < .001$. There were no significant two-way interactions.

In this analysis, a three-way interaction appeared, $F(1, 208) = 6.09, p < .01$. As Figure 1 shows, in grade 3 the CORI students were higher than traditional students on both old (pond/desert) and new (volcano/river) knowledge domains, $t(140) = 3.84, p < .01$. Unless noted otherwise, all follow-up

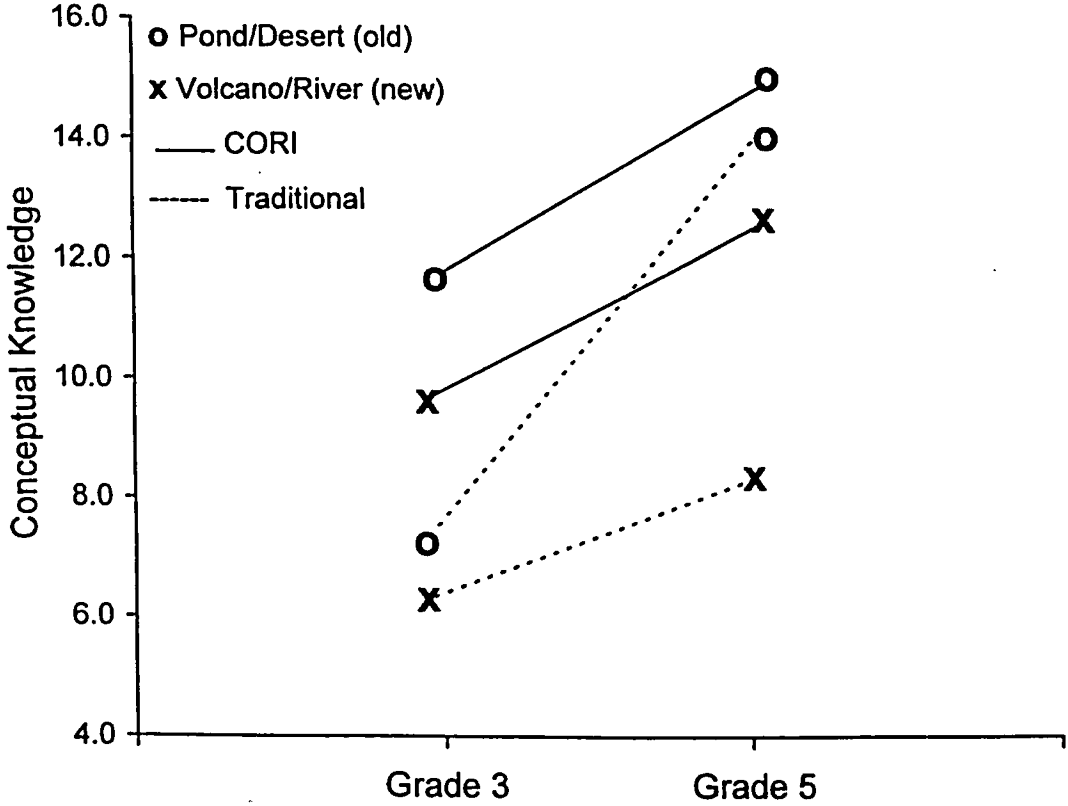

FIG. 2.—Levels of conceptual knowledge for Concept-Oriented Reading Instruction (CORI) and traditional students in new (volcano/river) and old (pond/desert) knowledge domains.

comparisons are made with Bonferroni *t*-statistics (Pedhazur & Schmelkin, 1991). In grade 5, CORI students were higher than traditional students in the new knowledge domain, $t(53) = 2.11, p < .05$, but not in the old knowledge domain. This follow-up was made with a simple *t*-statistic with pooled variance. The similarity of grade 5 CORI and traditional students in the old knowledge domain could be attributed to the fact that the grade 5 CORI teacher in one school gave the students in the traditional classroom 30 days of instruction in the old knowledge domain similar to instruction the CORI students received.

Question 2 was, To what extent does CORI increase motivated strategy use in familiar and new knowledge domains? To address this question, a 2 (instructional type) × 2 (knowledge domain) × 2 (grade level) ANCOVA was conducted. The dependent variable was a measure of motivated strategy use, drawn from the search task, consisting of the sum of the number of relevant texts, the accuracy score, and the paraphrase score. The covariates were the standardized reading test and prior knowledge score on the performance assessment. The assumption of homogeneity of regression was met. There was a significant main effect for instructional type, $F(1, 21) = 3.73, p < .05$, with CORI students ($M = 16.87$) higher than traditional students ($M = 14.51$). The main effects for domain and grade were not significant. There was no significant interaction of instructional type with knowledge domain. There was a significant interaction for type of instruction by grade, $F(1, 210) = 7.25, p < .008$, and for knowledge domain × grade, $F(1, 210) = 5.79, p < .02$.

The two-way interactions were not interpreted because they were subsumed by a significant three-way interaction, $F(1, 210) = 6.16$, $p < .01$, shown in Figure 2. This interaction indicated that in grade 3, CORI students were higher than traditional students in both knowledge domains $t(139) = 4.58$, $p < .01$. However, in grade 5 the CORI students were higher than traditional students in the old domain, whereas the traditional students were higher than the CORI students in the new knowledge domain, although neither effect met the Bonferroni criterion for significance.

To examine effects on the transfer task, a 2 (instructional type) × 2 (knowledge domain) × 2 (grade level) ANCOVA was conducted. The transfer score was the dependent variable, and the standardized test and prior knowledge score were covariates. The data met the assumption of homogeneity of regression. There was no main effect for type of instruction, although there was an effect for knowledge domain $F(1, 210) = 9.48$, $p < .002$, in which scores were higher on the pond/desert task ($M = 3.23$) than the volcano/river task ($M = 2.77$). A grade effect occurred, $F(1, 210) = 21.19$, $p < .001$, in which grade 5 students ($M = 3.37$) were higher than grade 3 students ($M = 2.69$). There were no significant two-way or three-way interactions.

Two text comprehension tasks were included to determine whether CORI students differed from traditional students on both the narrative and expository comprehension tasks. An initial analysis was conducted with both as dependent variables. The analysis was a 2 (instructional type) × 2 (grade) × 2 (knowledge domain) MANCOVA with the standardized reading test as the covariate. The effect for instruction was significant, $F(2, 191) = 3.53$, $p < .03$, with CORI students higher than traditional students. There was an effect for domain, $F(2, 191) = 9.07$, $p < .001$), in which the volcano-river text was easier than the pond-desert text. There was a grade × domain interaction, $F(2, 191) = 51.09$, $p < .001$, in which students had higher scores on the volcano-river than pond-desert in grade 3, but the students had higher scores on pond-desert than volcano-river in grade 5. These comparisons were not tested because they were examined in the follow-up tests. The other effects and interactions were not significant. Within the MANCOVA, the effect of instruction was significant for the narrative task ($p < .02$), but the instructional effect was not significant for the expository task. Therefore, follow-up ANOVAs were conducted.

For the informational text comprehension task, a 2 (instructional type) × 2 (knowledge domain) × 2 (grade level) ANCOVA was conducted. The informational task was the dependent variable, and the standardized reading test was the covariate. There was no effect for instructional type or grade, but there was an effect for domain, with the volcano-river text ($M = 7.31$) easier than the pond-desert text ($M = 6.70$), $F(1, 216) = 9.46$, $p < .002$. There was a domain × grade interaction, $F(1, 26) = 68.02$, $p < .001$, in which the volcano-river text was easier than the pond-desert text for students in grade 3, $t(141) = 7.48$, $p < .01$, whereas the pond-desert text was easier than the volcano-river text for fifth graders, $t(110) = 3.12$, $p < .01$.

On the narrative comprehension task, a 2 (instructional type) × 2 (knowledge domain) × 2 (grade level) ANCOVA was conducted. The narrative score was the dependent variable, and the standardized reading test score was the covariate. There was a significant effect for instructional type, $F(1, 204) = 4.85$, $p < .02$, in which CORI students ($M = 5.31$) scored higher than traditional students ($M = 4.77$). There was also a significant effect for knowledge domain, $F(1, 204) = 22.20$, $p < .001$, in which the narrative on the pond-desert theme ($M = 5.42$) was easier than the narrative on the volcano-river theme ($M = 4.66$). Finally, there was a significant grade × domain interaction, $F(1, 195) = 22.91$, $p < .01$, in which the pond-desert task was easier than the volcano-river task for third graders, $t(143) = 6.26, p < .01$, but the two domains were similar for grade 5 students.

Discussion

In the first section of this article, we proposed a set of principles that describe a context for the acquisition of reading engagement. Consistent with the literature on motivation and reading, these principles included the following: conceptual theme, real world interaction, self-direction, strategy instruction, collaboration, self-expression, and coherence. The principles represent features of extended instructional units in which students learn reading/language arts and science simultaneously. Classrooms that embody these principles emphasize situated learning (Anderson, Reder, & Simon, 1996; Brown, Collins, & Duguid, 1989; Lave & Wenger, 1996).

Advocates of situated learning suggest that learning will be more meaningful, permanent, and deeply internalized when it occurs in a relatively natural context. Situated learning takes place in a context in which it is immediately relevant and useful (Reynolds, Sinatra, & Jetton, 1996). In contrast, reading instruction in classrooms is often decontextualized. For example, when reading skills are taught in one situation (e.g., 1 hour of the day for language arts instruction) and they are then applied in another situation (e.g., another hour of the day for social studies), the learning of reading is not situated. In departmentalized reading instruction, instruction is not located in the context in which it will be used, or where it has immediate relevance.

What does it mean to say that reading instruction is situated? Despite the strongly held convictions of advocates for situated learning (partially described in Anderson et al. [1996]), the nature of situation, or context, has not been well defined. Relatively little attention has been given to identifying the characteristics of a context that make it productive and fruitful for motivation and learning. The principles we propose here are intended to take a step toward characterizing contexts that promote motivation and cognitive strategies in reading. The features of real world interaction, self-directed learning, and collaboration, in particular, are expected to be motivating. The characteristics of strategy instruction, conceptual theme, and coherence are contextual characteristics expected to help students gain expertise in strategies for reading, writing, and thinking.

A limit of situated learning is that it may be confined to the topic, text, circumstances, and cognitive processes of the particular situation of initial learning. The situation may contain barriers to transferring what is learned. If situated learning enables students to develop reading motivations and strategies that are transferrable, it will be more useful than if the learning is bounded by the original context. Therefore, an important test of reading instruction is whether it enhances the motivated use of strategies in a new knowledge domain.

This study suggests that the principles of CORI enabled students to increase their reading engagement within both a familiar and a new domain. During the year of instruction, life science was emphasized in all of the classrooms. On the performance assessment at the end of the year, CORI students showed relatively high levels of conceptual learning in the life science topic of ponds and deserts at both grades 3 and 5. In addition, students in CORI classrooms showed higher motivated strategy use in this familiar topic than did traditional students, although the effect was larger for grade 3 students than for grade 5 students. This study suggests that CORI students' reading engagement and conceptual learning were transferred to new domains of knowledge. In the new discipline of earth science (e.g., volcanoes and rivers), which was not taught in any of the classrooms, CORI students showed relatively high levels of conceptual learning. The CORI students' ability to gain new conceptual knowledge in the new knowledge domain was higher than that of traditional students at both grades 3 and 5.

Motivated strategy use in the new domain was also higher for CORI students than for traditional students at grade 3. However, the traditional students were higher than CORI students at grade 5. It should be noted that grade 5 CORI students were higher than traditional grade 5 students in conceptual knowledge on the performance assessment. In addition, it is possible that CORI students motivated to use strategies in the new domain did not record their learning in their search logs as fully as traditional students. It is also possible that CORI students identified a few particularly relevant packets of text that were sufficient for learning but were not recognized in the coding system.

The findings suggest that CORI students acquired generalized strategies and curiosity, with the exception of fifth graders' strategy use in new subject matter. Previous studies show that intrinsic motivations and strategies are highly associated in extended tasks of conceptual learning from text (Guthrie et al., 1996; Pintrich & Schrauben, 1992). Consequently, the data suggest that CORI students' motivations were not confined to the subject matter and texts of original instruction. Their motivation for seeking information and understanding text extended across broad disciplinary boundaries.

The quasi-experimental evidence reported here suggests that students in CORI classrooms showed higher reading engagement and conceptual learning than students in traditional classrooms. Consistent with other studies of instructional contexts (see Purcell-Gates, McIntyre, & Freppon, 1995; Whitehurst et al., 1994), the empirical issue was whether the set of principles in the intervention appeared to increase various aspects of student achievement. Purcell-Gates et al. (1995) noted that whole-language classrooms differed from skills-based classrooms in several characteristics including the amount of reading aloud, book exploration, literature discussion, self-chosen writing, and use of narrative texts. Whitehurst et al. (1994) reported an early literacy intervention that included small-group reading, tutoring, video training for teachers, altered books, sound training, worksheets, and extension activities. Similar to these studies, in our investigation we attributed the effects to a composite of the components of instruction (seven principles) and the texts. Like teachers in the Whitehurst et al. (1994) study, the teachers in our sample were comparable in age, experience, and teaching expertise. Also like Whitehurst et al. (1994), we used covariates to remove initial differences as sources of the intervention effect. However, in our investigation, consistent with others, classes rather than individuals were assigned to treatments, thus reducing the within-group variance to an unknown degree. In addition, teachers taught one but not both instructional conditions, making a teacher effect or a teacher × method interaction possible, and thus reducing the certainty of the inferences. In a study with a larger number of teachers, this possibility can be analyzed statistically. Because these factors could increase or decrease instructional effects, replication of the study is recommended.

The higher level of reading engagement in this study was attributed to a composite, which includes the CORI principles and the texts used in the classrooms. Individual principles in this instruction were not investigated, which might be valuable. However, constructivist approaches to instruction are inherently complex, involving classroom organization, student-centered instruction, and assessment tied to teaching (Au & Carroll, 1997). Such classrooms almost certainly operate as a system (Salomon, 1991), and this system warrants further research. It appears that CORI classrooms, despite their complexity, can be identified reliably (from teacher questionnaires as evidenced in this study), and the effects of these contexts on students' literacy engagement and conceptual learning are predictable. Consequently, this study suggests an important role for this contextual composite in increasing engagement in reading.

The quasi-experimental method in this study was selected for a purpose. Researchers and practitioners alike have asked whether there is evidence that the principles proposed here improve children's reading. In this study we attempted to address that issue. Alternative, more naturalistic inquiries (Erickson, 1986) and case studies (Yin, 1994) might also be used to examine how these contextual characteristics relate to literacy engagement, and one study has been completed (Guthrie & Cox, 1998). Such approaches portray student literacy engagement and contextual interactions of individuals in particular situations. Although these portraits are revealing, they do not address the question of this study.

The evidence that these contextual principles can increase reading engagement should be viewed cautiously for several reasons. The subject population was not nationally representative. The schools in this study were low income. From one perspective, this is a population needing instructional innovation and research. However, new trade books used in the instruction may have been more exciting to students than the same books in a higher-income school. The reading level of the schools was typical of the district, which was thirtieth percentile on standardized reading tests. It is possible that the contextual principles described here would not be as valuable for higher-achieving students. In the design, different teachers provided CORI and traditional instruction. Thus, it is possible that we observed only a teacher effect rather than an instructional program effect, or possibly, we observed a teacher × method interaction effect. Replication is needed to verify our results. Further, the dependent variables emphasized higher-order reading rather than basic skills. We have no quantitative evidence about whether CORI improved word recognition and such processes as spelling. Consequently, studies of the generality of the benefits of CORI using different outcome measures in schools with other demographics are needed.

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