Chapter 4
Increasing Opportunities To Acquire Knowledge Through Reading

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The way in which students spend their time in American elementary classrooms has changed substantially over the past decade as a result of new educational policies (NCLB, 2001). The nature and magnitude of these changes is evident in the findings of two recent studies that report that students are spending more time in reading/language arts and mathematics instruction than was the case a decade ago (Dorph, Goldstein, Lee, Lepori, Schneider, & Venkatesan, 2007; McMurrer, 2008). Whereas elementary teachers had previously been devoting an average of two hours a week to science instruction, 80% of the teachers studied by Dorph et al. (2007) reported allocating an hour a week to science and another 16% reported spending no time in science. The gap between the literacy proficiencies of many American students and the complex literacy demands of the information age has resulted in a decade of policies that require more time spent in reading/language arts instruction for students not meeting standards. If students aren't reading well, policy-makers reason, they should be spending more time learning to read. The phase of learning to read has been conceptualized as primarily a narrative experience and an experience that centers on the learning of linguistic content (e.g., phonemes) and of reading strategies (e.g., summarizing main ideas).

The perspective that we will develop in this chapter is counter to this commonplace interpretation of what beginning and struggling readers need. We will argue that an important part of the reading experience for all students, but particularly struggling readers, is to read to acquire knowledge. We are not suggesting that beginning and struggling readers do not require

exposure to and experiences with information about the alphabetic system, nor are we suggesting that narratives have no place in the early reading curriculum. But we will argue that acquiring knowledge is an important, and currently neglected, part of reading development. Acquiring information through text, we will demonstrate, serves as a powerful incentive for reading and writing. Increasing the amount of instructional time devoted to reading skills while decreasing opportunities to use reading and writing to learn about the physical and social world may serve to decrease involvement and expertise in reading. In addition, knowledge is critically important for continued reading, learning, and school achievement, and so reading instruction should be viewed as one context in which to build this knowledge. Delaying involvement with the compelling information of science and the social studies until students can "read well" may have the unintended consequences of making the poor even poorer, while the rich get richer (Stanovich, 1986). We suggest that the integration of literacy and content-area instruction is a potentially effective way to create an engaging, knowledge-supportive context for learning to read as well as necessary for students' acquisition of critical bodies of knowledge.

In this chapter, we develop a model of integrated content-area and literacy learning in three phases. First, we review scholarship to establish how knowledge acquisition affects comprehension and how it is affected, in turn, by reading experiences. The second section of the chapter presents prior efforts in which language and literacy processes have been integrated or combined with content-area learning goals. Finally, we present theory and research for integrated instruction where knowledge acquisition is in the foreground and reading processes are developed in service of that knowledge acquisition.

Knowledge Building As A Goal of Literacy Instruction

The model in Figure 1 demonstrates the cyclical relationship between knowledge and

comprehension. Comprehension depends on background knowledge. Since knowledge begets more knowledge, comprehending the information in texts serves as the context for obtaining and elaborating upon knowledge. This section of the chapter describes the research on the processes depicted in this model—the manner in which knowledge is developed through literacy and the manner in which knowledge supports comprehension. Underlying these processes is the relevance or authenticity of knowledge acquisition in students' learning.

Developing knowledge

In the context of discussing the relationship between school funding and educational opportunity, Neuman and Celano (2006) argue the significance of the knowledge gap between low-income and middle-income children. They suggest not only that knowledge leads to more knowledge—those who have access to information read more, have higher-level conversations, and more continued educational opportunities—but also that the knowledge gap is associated with quality-of-life differences, including health and crime prevention.

We know a great deal about the strong relationship between background knowledge and school learning (e.g., Alao & Guthrie, 1999; Hailikari, Nevgi, & Komulainen, 2008): the more people know about something, the more likely it is that they will learn something new about it. This work also suggests that learning that is not connected to existing knowledge is more likely to be forgotten. Dochy, Segers, and Buehl (1999) reported that more than 90% of the studies examining the contribution of prior knowledge to learning have found an effect and that prior knowledge generally explained between 30% and 60% of the variance in performance on outcome measures of learning.

Given this relationship between background knowledge and academic achievement, Marzano (2004) suggests that enhancing knowledge should be at the top of any list of

interventions to support students' academic achievement. The most obvious way to enhance students' world knowledge is to provide knowledge-enriching experiences in school, yet literacy programs have long missed the opportunity to use reading, writing, and speaking as tools for developing knowledge (Marzano, 2004; Neuman & Celano, 2006). While literacy educators have suggested that reading instruction is enhanced by attention to content (Chall & Snow, 1988), literacy programs have largely emphasized the teaching of process (how) to the exclusion of content (what), distinguishing between learning to read and reading to learn (Palincsar & Duke, 2004). That is, literacy instruction often focuses on teaching students skills and strategies for decoding and comprehending text, and pays less attention to the content of the texts. As Palincsar & Duke point out, one problem with this approach is that it deprives students of the information that they might use to read, write, and think.

Using discipline-based knowledge development as a context for literacy learning provides an opportunity for students to practice and apply their emerging literacy skills in the interest of developing understandings about the world that support their future learning. Knowledge, from this perspective, does not refer to a litany of facts, but rather, the discipline-based conceptual understandings that provide explanatory principles for phenomena in the world (Guthrie & Alao, 1997) and engage students in becoming experts on the world around them. For example, in the project in which we have been involved over the past five years (Cervetti, Pearson, Bravo, & Barber, 2006; Cervetti, Pearson, Barber, Hiebert, & Bravo, 2007), science and literacy instruction are integrated in ways that invite students to become experts on important scientific topics. One unit develops the importance of shorelines as the habitat for innumerable fascinating organisms. Second- and third-grade students develop conceptual understandings that are likely to support their future learning, including the understanding that shoreline organisms

have characteristics called adaptations that aid in their survival in a habitat. At the same time, students are learning facts about shoreline organisms such as that gulls have webbed feet and that pismo clams have hard shells. These facts are grounded in the concept of adaptation and it is this conceptual grounding that makes this information something more than a collection of fascinating facts or seductive details (Garner & Gillingham, 1991). The essential understanding that adaptations help organisms survive guides students in predicting that the webbed feet of gulls aid them in swimming in the shoreline habitat to escape predators and find food, or that clams have hard shells that serve as protection from predators and crashing waves. It is the discipline-based conceptual understanding about adaptation that becomes the readers' newfound "prior" knowledge that will support future learning—and reading—in the domain.

Supporting Comprehension with Knowledge

There has been a strong emphasis in the research and practice literature in reading education on activating prior knowledge for reading (e.g., Harvey & Goudvis, 2007; Pressley, El-Dinary, Gaskins, Schuder, Bergman, Almasi et al., 1992; Spires & Donley, 1998), but less on finding ways to build knowledge to support reading comprehension. The problem with activating prior knowledge without building knowledge is that it privileges the students who have knowledge already, and it depends on the knowledge that students bring to school.

Readers who have more knowledge of the topic of a text demonstrate better comprehension and recall (e.g., Tierney & Cunningham, 1984), particularly when reading texts that require more gap-filling inferences—those inferences that require a reader to fill in details that the author omitted (McNamara, Kintsch, Songer, & Kintsch, 1996). In their review of the contribution of factors such as knowledge, strategies, goals, and interest to constructing meaning from text, Jetton & Alexander (2001, para. 19) suggest that nothing exerts a more powerful

influence over what students understand and remember from reading a text than their existing knowledge. Prior knowledge has been shown to make a greater contribution to text comprehension than decoding or reported use of strategies (Samuelstuen & Bråten, 2005), and to make a contribution to comprehension independent of topic interest (Baldwin, Peleg-Bruckner & McClintock, 1985). Readers with more knowledge of the topic of a text also perform better on comprehension assessments than readers with less knowledge, independent of reading ability (e.g., Recht & Leslie, 1988).

Several decades ago, when schema theory was in the foreground, the research and pedagogical suggestions of researchers and teacher educators emphasized the reciprocal relationship between reading comprehension and knowledge. Schema theory (Anderson & Pearson, 1984) described the relationship of knowledge to comprehension as a cycle wherein knowledge supports comprehension and comprehension in turn builds new knowledge. This understanding of the relationship between comprehension and knowledge suggests that the new knowledge that students develop today, be it from a book or from an experience, is the prior knowledge they will bring tomorrow to another experience or another text. The vestiges of this understanding are still evident in the instructional focus on preparing children to read by activating text-relevant knowledge (Duke & Pearson, 2002).

We suggest, however, that the cognitive revolution's vision of knowledge as the basis of reading comprehension had been only partially realized. Literacy educators attended to activating prior knowledge and teaching students to bring this knowledge to bear on their comprehension of text. At the same time, the other half of the cycle—where comprehension builds new knowledge--was shortchanged as literacy educators moved to literature-based reading programs. While this movement had some positive outcomes (e.g., students got to read real

literature), the expanded literacy curriculum has largely squeezed out content-area instruction and, consequently, attention to knowledge-building altogether (Kato & Manning, 2007).

While students acquire pockets of knowledge from wide reading, in-depth knowledge development may provide more benefits. As Jetton and Alexander (2001) point out, substituting superficial coverage of content for in-depth exploration of concepts can form a disjointed and piecemeal basis for further text-based comprehension and learning. There is some evidence that broader disciplinary knowledge is more powerful for supporting reading comprehension of content-area texts than knowledge of a specific topic. In their study of the role of subject matter knowledge on recall of and interest in science expository text, Alexander, Kulikowich, & Schulze (1994) found that college students who had more content-area knowledge, particularly in the form of domain knowledge, produced higher scores or gave higher interest ratings than those with less content-area knowledge.

Much has been written about the contribution of prior knowledge to comprehension (see, e.g., Stahl, Hare, Sinatra, & Gregory, 1991). A primary way in which prior knowledge supports comprehension is that students with more knowledge can assimilate additional information and distinguish between important and more peripheral information (Alao & Guthrie, 1999). Kintsch and Kintsch (2005) point out that readers must construct a situation model, a mental model of the situation described by the text, requiring an integration of text information with relevant prior knowledge and reader goals. As Garner & Gillingham (1991) point out, "If a topic is entirely unfamiliar, there is no way to relate new information in a text to existing knowledge structures."

In addition, knowledge is needed to understand the relationship between ideas in a text. Stahl et al. (1991) found that readers with low prior knowledge are able to recall as many facts as those with high prior knowledge, but readers with high prior knowledge are better able to infer

an organization to those facts and selectively attend to different portions of the text (in particular information that is related to the themes of an article).

In recent years, there has been interest in nonfiction and informational text driven in part by documentation of a genre imbalance in the early grades (Duke, 2000) and by concerns about reading achievement in the upper grades, particularly the drop-off in reading achievement at fourth grade when students are expected to handle nonfiction texts with increased independence (Gambrell, 2005). Students' struggles with reading and comprehending nonfiction texts have been documented across grade levels (McGee, 1982; Hidi & Hildyard, 1983) and their performances have been found to be comparatively poorer with expository than narrative texts (Dreher, 1999). These difficulties, it has been argued, reflect the lack of significant exposure to informational texts in the early grades (Yopp & Yopp, 2000) and little instruction in the structures and functions of informational texts (Duke & Bennet-Armistead, 2003). Students may also lack the knowledge that would make these content-rich texts accessible.

We do not wish to minimize the importance of skills and strategies associated with decoding, fluent oral reading, and reading comprehension. Instead, we want to suggest that knowledge and skills are mutually supportive. Kintsch & Kintsch (2005) suggest that the goal of reading comprehension instruction is to assist students in constructing good situation models from texts in order to understand and retain information. In this view, comprehension requires a combination of knowledge and strategies/skills. In addition, these processes are supported when reading instruction is situated in a meaningful, knowledge-building context that fuels literacy development by providing background knowledge for future reading and future learning, and that inspires literacy development by engaging students in becoming experts on the world around them. As we describe below, reading about something compelling in the natural world from an

increasingly informed knowledge base can provide greater ease of reading as well as a motive for continued reading. In our own work, we connect students' firsthand investigations—of the solar system, energy, and ecosystems—to the texts they read, so that they are mutually informing and together build sustained engagement in a set of ideas, yielding opportunities for rich discussions, complex forms of writing, and, indeed, instruction in the skills and strategies of reading.

Building Authenticity with Knowledge

Many arguments for integration of literacy and content instruction stem from notions of increased authenticity and engagement (Guthrie, Wigfield, & Perencevich, 2004a). From this perspective, instruction that situates conceptual understandings, or knowledge as the ends of instruction, positions reading, writing, and discourse as tools to achieve these ends creates the kind of need to know that can motivate engaged reading and propel literacy development ahead.

Reading for real reasons. Several studies have offered compelling evidence that growth in reading engagement and reading comprehension is accelerated when students are involved in authentic reading activity (e.g., Knapp, 1995; Purcell-Gates, Duke & Martineau, 2007). By "authentic," we mean reading real texts for real purposes—i.e., where the goal of reading is understanding the material well enough to use it for other purposes, such as making an argument, applying a concept in some way, or engaging in a firsthand investigation. Hiebert (1994) similarly defines authentic tasks as "ones in which reading and writing serve a function for children..." and "involve children in the immediate use of literacy for enjoyment and communication" (Hiebert, 1994, p. 391). Authentic literacy tasks focus on student choice and ownership; extend beyond the classroom walls; involve a variety of reading and writing opportunities; promote discussion and collaboration; and build upon students' interests, abilities,

background, and language development (Hiebert, 1994).

Purcell-Gates et al. (2007) examined student growth in reading and writing informational text genres. The project infused second- and third-grade classrooms with the target text genres and monitored, among other things, the degree of authenticity of literacy activities in these classrooms. Authentic literacy activity was defined as (a) the reading and writing of text genres that serves a communicative purpose that can occur *outside of a* learning-to-read-and-write context and purpose (e.g., reading for information that one wants or needs to know, such as reading instructions to complete a task) and (b) the match between the genres that students read in school and the actual tasks that those genres might be used for in the world outside of school. Purcell-Gates and her colleagues reported that student growth in reading and writing the target genres did not relate to the amount of time spent reading and writing the genres alone or even explicit teaching of genre features. The crucial ingredient was the nature of the interaction with text. Students in classrooms with more authentic reading and writing of science informational and procedural texts (that is tied to authentic communicative purposes and an authentic need to know) grew at a faster rate than those with less authenticity.

An emphasis on deep understanding. A number of studies, including the CIERA School Change Study (Taylor, Pearson, Peterson, & Rodriguez, 2003), have found that reading achievement is higher the more teachers emphasize deep understanding of text rather than literal comprehension or recall. Readers who are driven by a learning goal and engaged in deep processing of information are more likely to recall information from text (Graham & Golan, 1991). Participation in knowledge building, or reading with a knowledge goal, demands a level of involvement in text and a level of meaning making that might not be demanded of reading isolated texts. A knowledge goal provides opportunities for deep processing of textual

information, for connecting ideas across texts, and for making meaning of information through writing and, in science, through subsequent investigations.

In addition, Guthrie et al. (2004a) suggest that conceptual goals for reading increase interest and enjoyment. They point out that it is motivating to develop expertise—to know about something, to learn more about it, to connect it to other learning, and to be able to explain it. Jetton & Alexander (2001) similarly conclude that, while the skills and strategies of reading are important, readers "also need a commitment or will to explore text in a deep or meaningful way." Ongoing investigations of the natural and social world provide a reason to persist through the reading of challenging texts. Learning what others have discovered about the world and sharing one's own discoveries can be powerful motivators for learning to read, write, and speak effectively.

There is some evidence that students are more strategic when reading and writing is associated with a learning goal that extends beyond the particular text at hand. Examining the role of a learning goal orientation in reading, Alao & Guthrie (1999) found that after controlling for prior knowledge, a learning goal orientation accounted for 34% of the total variance in students' use of higher level reading strategies, such as monitoring and elaboration. In fact, in the Alao & Guthrie (1999) study, learning goals was a better predictor of strategy use than prior knowledge. A large body of research demonstrates the association between learning goal orientations and learning outcomes.

Both of these characteristics—reading for real purposes and reading for deep understanding—are supported by knowledge goals. Approaches to reading in contexts where the learning goals emphasize acquiring the knowledge or skills of another discipline may tend toward a more functional view of literacy, employing reading, writing, and discourse as a set of

tools and processes that people use to acquire knowledge in other domains. Not only do content-area disciplines create a setting in which students can "practice" applying their discrete reading and writing strategies, they also foster opportunities for sophisticated and dynamic enactment of these strategies in the service of learning about the world. When a knowledge goal is positioned as the "ends" of instruction, even discrete skills can be taught in the context of meaningful reading rather than out-of-context reading. That is, even when teaching skills, knowledge goals keep the focus on meaning and render transparent the relationship between the skills and the goal of constructing meaning from text. As Goodlad & Su (1992) point out, an integrated curriculum can build close relationships among concepts, skills, and values so that they are mutually reinforcing.

The Evolving Relationship of Reading and Content

Having put forth three arguments for attention to knowledge in reading instruction, we shift our focus to attempts schools have made to characterize and enact this relationship. Over the last hundred years, a number of educational movements have embraced the idea of combining the development of reading, writing, speaking, listening, and viewing processes with content-area learning goals. In essence, we want to align and distinguish the approach we advocate—an integrated approach to literacy and content-area instruction—from related instructional approaches that have come before, making sure to emphasize both commonalities and distinctions.

Origins in the Progressive Movement

The origins of integrated approaches to reading and content-area instruction are often associated with the progressive movement in education that started in the first half of the twentieth century. The Progressive tradition did not separate reading instruction from subject

matter instruction (Zirbes, 1928). Rather than isolating literacy skills instruction, many progressive educators believed that reading was to be "organically bound up" with all of the other content-based learning work of the school (Thorne-Thomsen, 1901). Progressive educators, such as Francis Parker and John Dewey, argued that all reading should be focused on the study of subject matter. In this way, the learning of reading, writing, speaking, listening, and viewing was necessarily integrated with and *in the service of* content-area learning. Characteristic of this movement was Parker's (1894) declaration that:

> In the school all the reading should be a direct means of intensifying, enhancing, expanding, and relating the thought evolved by the study of the subjects….reading in botany , in zoology, in history—in fact, all reading—should be concentrated upon the study of the central subjects. (p. 220)

In 1925, the National Committee on Reading stressed the importance of reading for a reason, characterizing the relationship between reading and subject matter as follows: "The difficulty which constantly confronts the teacher is to keep the reading skills sufficiently in the foreground that they may be improved and refined, yet at the same time make them subservient to the real interests and larger purposes for which pupils read" (Whipple, 1925, p. 140).

While the initial basis for this integrated approach to reading and content-area instruction was largely theoretical rather than empirical, this element of the progressive movement underpinned the Eight Year Study from the 1930s. The study found that college students who had attended progressive high schools with integrated instruction across disciplines as one of its foundations outperformed students from traditional high schools on standardized tests (Chamberlin, Chamberlin, Drought, & Scott, 1942). Nevertheless, by the middle of the twentieth century, many of the principles guiding the progressive movement in education, including those

associated with integrated instruction, were subjected to serious criticism. Some held the movement responsible for producing citizens who were under-prepared for careers in science and technology, advocating a return to instruction that towed more traditional disciplinary lines. As a result, instruction shifted to more a reductionist, behavioristic view of reading (Moore, Readance, & Rickelman, 1983).

Thematic Instruction

In the last part of the twentieth century, integrated instruction reemerged in different forms, including thematic instruction. Thematic instruction commonly refers to instruction organized around broad topics in order to facilitate connection-making across academic domains (Lederman & Niess, 1997). Some educators distinguish thematic instruction from other forms of integrated instruction that organize different subject areas around narrower real-world problems to form a "seamless whole" wherein distinctions among academic disciplines melt away. We use thematic instruction to refer to a broad set of approaches that use themes as a framework on which to merge language and literacy learning with content area learning.

While thematic instruction invited subject matter topics back into language arts instruction, its focus was on supporting literacy more than serving knowledge development or content-area learning. In the 1970s and 1980s, the emergence of whole language brought with it a form of instruction designed to make literacy learning more meaningful and authentic by centering reading and writing activities around content-relevant themes (Morrow, 2001). In her review of how thematic instruction found a comfortable home in the whole language movement, Morrow explains that whole language, with its focus on teaching literacy skills as needed depending on what the children were reading or writing, freed teachers to use different kinds of organizing heuristics for literacy instruction, including themes. With these early forms of whole

language thematic units, literacy instruction remained the primary goal, and eventually, thematic language-arts basal programs followed suit.

While many basals have been organized thematically since this time, the lack of attention to subject-matter relevant content has long been noted (e.g., Flood & Lapp, 1987; Stotsky, 1997). Even as basals have included more expository text in recent years, attention has not been paid to substantial knowledge development (Walsh, 2003). Possibly in part as a reflection of this, the latest rendering of thematic instruction as it is instantiated in basal programs and enacted in language arts instruction often incorporates themes as loose umbrellas for literacy instruction. These themes (e.g., "bears," "water," and "change") allow teachers and publishers to identify materials and activities that are topically related, but probably do not realize the potential of integrated instruction for disciplinary knowledge development.

While contemporary thematic instruction is often a testament to teachers' creativity and ability to build connections across domains, the possibility remains that the connections may be tenuous (Holdren, 1994). Because the focus is squarely on supporting literacy development, activities are typically chosen based on their link to the theme rather than their potential to deepen students' knowledge of the domain. And although classroom experiences centered on a unifying theme may provide students with multiple exposures to related academic vocabulary, such instruction does not guarantee that this is done is any systematic way. Indeed, some research suggests that students engaged in thematic instruction develop less conceptual understanding than they would with more discrete approaches (Lederman & Niess, 1997). Although the instructional response we propose in this chapter centers around topics or themes in particular domains, it considers the goal of instruction to be not only connection making, but also building deep conceptual knowledge of the domain.

Reading Instruction in the Content Areas

Reading instruction in the content areas most commonly refers to content area teachers providing students with explicit instruction on various "good reader strategies" to facilitate word identification, vocabulary development, and comprehension while reading content area texts. As early as the 1920s major figures in education were calling for reading instruction that included specific skills needed for content-area study (Moore et al., 1983). It was Gray (1925) who popularized the slogan "Every teacher a teacher of reading." Recent attention to content area reading came about in response to research that has documented that students across grades struggle with reading and understanding content-area and other expository texts and the recognition that different reading strategies may be needed depending on the nature of the reading material and the purpose (Dreher, 1999; Hidi & Hidyard, 1983; McGee, 1982; Moore et al., 1983).

Content area reading instruction

It is reasonable to expect that strategic reading can enhance content area learning, however, it is important to bear in mind that text is typically operationalized as traditional textbooks rather than the broad range of nonfiction genres that readers are likely to encounter beyond the classroom. Consequently, it may be the case that the notion of text in content area reading instruction is not rich enough to help students acquire a wide range of understandings about content area and about literacy (Beck & McKeown, 1991).

Alternatively, some curricular instantiations of content area reading programs commonly take the forms of more traditional content-area instruction augmented by the use of nonfiction trade books (Palmer & Stewart, 1997). As Palmer points out, "increasing numbers of teachers are supplementing or supplanting textbooks with nonfiction trade books" (p. 630). Important to take

into account, however, is the fact that making effective use of nonfiction trade books may require supplemental support for both teacher and student so these new texts are not simply treated as another textbook (Palmer & Stewart, 1997). We suggest that true integration of literacy and content-area instruction can provide the opportunity for students to deepen their learning of the content as they broaden their understanding of, and facility with, the skills and strategies of nonfiction reading and writing.

Use of Nonfiction or Informational Texts

As Duke (2000) pointed out nearly a decade ago, students in many classrooms get much smaller doses of informational texts than the narrative fiction texts that often dominate much of their home and early school literacy experiences. This research in combination with research documented in the report, *Reading for Understanding (*RAND Reading Study Group, 2002), calls into question the decades-long assumption that text is text—that students can and will transfer generic reading skills from fictional literature to other genres of text. The research summarized in the Rand report indicates that, for students to use nonfiction text effectively, teachers need to directly instruct students on how to navigate and extract information from text. Such instruction on the part of teachers, Palmer and Stewart (1997) stress, depends on adequate training in using such texts, especially content area teachers who may have more limited text-based pedagogical knowledge.

In the intervening years, there has been a strong resurgence of interest in nonfiction and informational text. Further, evidence has verified that many students are genuinely interested in reading nonfiction texts (Duke & Bennett-Armistead, 2003; Edmunds & Bauserman, 2006; Mohr, 2006). As a result, many teachers have expanded the number nonfiction texts in their classroom libraries, basal programs have boosted percentages of nonfiction selections, and

publishers have increased their selections of nonfiction trade books. Most educators will agree that it makes sense to provide students with more exposure to a broad range of nonfiction text structures and features they are liable to encounter outside the classroom. Even so, simply giving students nonfiction texts—especially ones that superficially address numerous different topics—may be insufficient in developing bodies of background knowledge and engaged reading. As we consider in the next section, evidence is mounting that experiences with nonfiction texts can be more powerful if they are related to and situated within content area instruction that has the potential to build students' skill with different genres of text and extend their conceptual understandings.

Integrated Instruction that Foregrounds Knowledge

The instruction in reading that we envision is more than opportunity to read--it is opportunity to learn *something meaningful* through text and related activities around text (i.e., discussion and also hands-on learning experiences). McRae and Guthrie (Chapter 3, this volume) have talked about this phenomenon as "beyond opportunity to read." Our way of describing the phenomenon is "opportunity to learn"—something that we believe is best achieved through the integration of content-area learning and literacy learning. The instruction we envision integrates content-area learning with an emphasis on reading and writing in the context of knowledge development and on the cultivation of shared and reciprocal processes across domains. In our work on science-literacy integration, we have often used the word *synergistic* to describe this relationship (Cervetti et al., 2006).

In many respects, this synergistic approach harkens back to the earlier forms of integrated instruction from the progressive era in education. In this approach, reading skills and strategies are taught and learned in a context that supports the development of disciplinary knowledge and

skills with high level of integrity. Scientific inquiry, reading, writing, and discussing are woven together in mutually reinforcing ways and always in the interest of important scientific understandings. In this approach, the concepts and skills of science are in the foreground. The content provides an engaging, enriching context for teaching the skills, strategies, and dispositions of literacy.

To provide a concrete example, consider an astronomy unit for fourth and fifth graders we developed recently for the Seeds of Science/Roots of Reading program that manifests our approach (Seeds of Science/Roots of Reading, 2009). In this unit, students investigate the ways that scientists and engineers use technology to learn about distant solar system objects (mainly planets and moons). Having studied many of these solar system objects earlier in the unit, students read about space scientists and space missions and engage in the activity of designing a spacecraft that might be successful in landing on and gathering data about a solar system object with a specific set of environmental conditions and surface features. Students write scientific explanations about how their spacecraft design and mission goals are suited to the conditions on the solar system object they intend to study. They learn about the models that scientists use to study their designs in advance of the missions. They learn about the persistence that is necessary to engage in the challenging enterprise of space exploration. They learn a great deal about the Solar System in which they live and the conditions, features, and movement of many of the objects therein. In the meantime, they learn about and engage in reading and writing scientific genres of text, learn the language and structures of scientific argumentation, and engage in rich discussions of the nature of science, scientific design, and our Solar System.

Approaches to integration of literacy and content-area instruction that foreground knowledge development are not simply intuitively appealing; their efficacy is increasingly borne

out by rigorous research programs. This research is providing increasingly compelling evidence that instructional approaches that integrate content-area instruction, particularly science and social studies (Gavelek, Raphael, Bindo, & Wang, 2000), with literacy, by foregrounding the development of knowledge, result in greater growth in literacy and disciplinary knowledge development than isolated instruction. Two programs have particularly impressive records of research: Concept-Oriented Reading Instruction (CORI) and In-Depth Expanded Application of Science (IDEAS). Each program has accumulated a record of learning outcomes across a number of studies using a variety of literacy measures, including standardized measures.

John Guthrie, Alan Wigfield, and their colleagues developed CORI to integrate inquiry science and reading strategy instruction in order to enhance elementary students' use of reading strategies, motivation to read, and conceptual knowledge in science and social studies (see Guthrie, Wigfield, & Perencevich, 2004b). The CORI program uses content goals for reading instruction, and creates a highly collaborative learning environment that engages students in hands-on activities and the reading of interesting texts related to the content goal.

The IDEAS Project (Romance & Vitale, 1992, 2001) is an instructional model that integrates science and literacy instruction by providing students with opportunities to access and build upon their prior knowledge; do hands-on science activities; read, write, and journal about science; and use a variety of instructional tools to build meaningful connections and increase their conceptual science understandings. Romance and Vitale (1992, 2001) have reported that what seemed to make the IDEAS model effective with students was the fact that it provided them with an opportunity to pursue an in-depth understanding of conceptually meaningful structured knowledge, not simple or superficial connections.

Similarly, while the objective of CORI is to increase the amount of students engaged

reading, CORI situates direct instruction of reading strategies within a context that allows students to develop in-depth knowledge on a science or social studies topic with a high degree of disciplinary integrity. In both programs, students construct meaningful knowledge and then use that knowledge to support future learning. An important characteristic of both programs is what CORI researchers call *coherence*, or the linking of activities and content in ways that enable students to make connections between experience and reading, strategies and content, and among different texts.

While other forms of thematic instruction in reading allow for connection-making, repetition of vocabulary, and possibly for the development of some background knowledge, both of these programs pursue substantive knowledge goals within the domain of science and use reading, writing, speaking, concept mapping, strategy instruction, and so on to further these goals. CORI and IDEAS not only use the context of science to build on students' curiosity about the world and allow that curiosity to drive reading instruction, they establish knowledge goals and a context of developing expertise that drives students' literacy development.

Conclusion

The schism between learning to read and reading to learn has been extensive and long-standing. We suggest that it is time to reconsider this schism. There are many reasons to believe that knowledge development may be the necessary next frontier in reading education. Progress has been made over the past decade in students' fundamental capacity to read but the gains have not been commensurate in their ability to comprehend and remember critical information. And the knowledge gap between wealthier students and lower-SES students persists. Knowledge is a necessary and natural outcome of reading, and evidence is beginning to demonstrate that reading instruction is more potent when it builds and then capitalizes upon the development of content

knowledge.

Equally important, though, is the potential of knowledge goals to engage students in reading (and writing and speaking). If we want students to persist through the challenges of learning to read, we need to provide a motive for reading that makes it worth the effort. If we want to inspire students to love reading, we need to give them opportunities to experience the power of reading to expose them to amazing new ideas and communities, to help them explore and explain the world around them, and to answer their questions. Knowledge goals provide motives for reading that go beyond getting the words straight or reading through to the end of the text. Children should be learning real things for real reasons as they read. We should not delay involvement in reading to learn until students have all of the skills of reading in place. Practicing for years on end without ever getting to play the game is no fun. And there is evidence that students who view reading as important are also students who love or like reading (Scholastic, 2008). To ensure that our students develop the skills to participate in the complex literacy experiences of the digital age and to ensure that they become truly engaged as readers, a first priority of literacy educators is to make reading genuinely important to students.

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Figure 1. Model of Reciprocity Between Knowledge and Comprehension