What Is Disciplinary Literacy and Why Does It Matter?

Timothy Shanahan and Cynthia Shanahan

Recently, it has been proposed that schools teach disciplinary literacy in science, mathematics, history, and literature classes as students move into middle school and high school. A disciplinary literacy approach emphasizes the specialized knowledge and abilities possessed by those who create, communicate, and use knowledge within each of the disciplines. This article compares disciplinary literacy with the more widely emphasized approach known as content area literacy and provides an analysis of the growing research base underlying the disciplinary literacy construct. Research studies on disciplinary literacy are drawn from expert–novice comparisons in which think-aloud data are collected, during reading, from experts (i.e., mathematicians, chemists, historians) and students, and from functional linguistics analyses of the features of the grammars in disciplinary texts to identify the purposes and cognitive and communicative approaches that these grammars reveal. Finally, implications for school programs and instruction are considered. **Key words:** *content area reading*, *disciplinary literacy*, *reading*

LATELY, educators have been turning their attention to the reading that is done in the content areas, such as mathematics, history, and science. The idea of focusing on reading within those subjects is not new, but it has gained new life as public attention has shifted from the problems of beginning reading to those of reading in adolescence. Education for young children has long accepted explicit and separate reading instruction as one of the basic three Rs (along with 'riting and 'rithmetic). However, with older students, the educational circumstances are different— middle and high schools do not usually assign a reading class to all students; many secondary schools do not even have remedial reading classes; and the idea of a core reading program and extensive professional development in literacy for teachers, both common practices in elementary education, are unusual.

Despite limited infrastructure and application, the idea of infusing literacy teaching into content subjects has complex roots and wide support. Yet, there is much confusion over what would constitute a sound content area literacy curriculum for middle school and high school students and what preparation their teachers need to receive. A fundamental premise of content area reading has been that, in secondary schools, reading should be "taught mainly in the subject fields with regular content materials and regular daily lessons" (Niles, 1965, p. 36). Educators have not yet reached this idyllic future, but content area literacy textbooks used for teacher education continue to promote the idea of content literacy as "the ability to use reading and writing to learn subject matter in a given discipline" (Vacca & Vacca, 2002, p. 15). As such, pre- and in-service training in content area reading education tends to emphasize the teaching of a generalizable set of study skills across content areas for use in subject matter classes.

Author Affiliation: *Department of Curriculum & Instruction, University of Illinois at Chicago.*

The authors have disclosed that they have no significant relationships with, or financial interest in, any commercial companies pertaining to this article.

Corresponding Author: *Timothy Shanahan, PhD, Department of Curriculum & Instruction, University of Illinois at Chicago, 1040 W Harrison (M/C 147), Chicago, IL 60607 (shanahan@uic.edu).*

More recently, the notion of disciplinary literacy has emerged (Shanahan & Shanahan, 2008). Although disciplinary literacy is a different construct from content area reading, its meaning has been confused to a great extent by those who erroneously use the terms interchangeably or who think that disciplinary literacy is just a new fad name for content area literacy. This is unfortunate because eliding these differences may lessen the likelihood that disciplinary literacy will gain a foothold in secondary education. Some might ask, "Why bother, if we are already teaching content area reading?" Our response is that failure to differentiate disciplinary literacy from content area literacy may mean that when schools do try to emphasize disciplinary literacy, teachers may struggle to support an ill-understood concept.

Given the potential for such confusion, the purpose of this article is to provide a brief introduction to the concept of disciplinary literacy. In this article, we explain what disciplinary literacy is, how it is different from traditional content area reading, where it comes from, and why it matters.

DISTINGUISHING DISCIPLINARY LITERACY FROM CONTENT AREA LITERACY

Content area literacy focuses on study skills that can be used to help students learn from subject matter specific texts. Disciplinary literacy, in contrast, is an emphasis on the knowledge and abilities possessed by those who create, communicate, and use knowledge within the disciplines. The difference is that content literacy emphasizes techniques that a novice might use to make sense of a disciplinary text (such as how to study a history book for an examination), whereas disciplinary literacy emphasizes the unique tools that the experts in a discipline use to engage in the work of that discipline.

But would these approaches not overlap, at least, with regard to what middle school and high school students need to learn? Will the reading techniques of content area literacy not be the same as resources that disciplinary experts employ? Surprisingly perhaps, the answer to these questions is often, "No." Content area reading *prescribes* study techniques and reading approaches that can help someone to comprehend or to remember text better (with little regard to type of text), whereas disciplinary literacy emphasizes the *description* of unique uses and implications of literacy use within the various disciplines.

The major premise of content area reading proponents has been that the cognitive requirements of learning and interpreting any kind of text are pretty much the same, no matter what the subject matter. In some cases, research in this area has evaluated student learning using texts drawn from particular disciplines, but despite this, nothing has been particularly specialized or discipline-specific about the guidance provided to the students.

Examples of reports in which differences among disciplines have been ignored or elided include research on early study techniques such as SQ3R (survey, question, read, recite, review), which was recommended for use with content area textbooks (Robinson, 1961). Other examples include early content area reading approaches, such as three-level guides (Herber, 1970); general reading comprehension strategies (e.g., summarizing, questioning, monitoring, visualizing), such as those considered by the National Reading Panel (National Institute of Child Health and Human Development, 2000); and electronic tutoring tools and guidance systems aimed at supporting readers' metacognition and interpretive interactions with disciplinary texts (Graesser, McNamara, & VanLehn, 2005; Magliano et al., 2005).

Consequently, content area reading proponents tend to treat content differences as the major distinction among the disciplines. Although such proponents may acknowledge that one reads about mathematics in a mathematics book and history in a history book, they (along with many others who study reading comprehension) emphasize that what readers need is a common set of reading strategies that could be applied, perhaps with some minor adjustments, to varied content area texts.

Thus, although researchers may examine the use of a comprehension strategy, such as the use of paraphrasing, within the context of science text, the effectiveness of such a strategy within science reading would not make paraphrasing a discipline-specific reading strategy. There is nothing about paraphrasing itself that is special to reading science texts; rather, one would find paraphrasing to be as useful in the reading of any text of similar difficulty and correspondence with readers' background knowledge.

For the past couple of decades, research has been revealing that disciplines differ extensively in their fundamental purposes, specialized genres, symbolic artifacts, traditions of communication, evaluation standards of quality and precision, and use of language. With regard to language use, different purposes presuppose differences in how individuals in the disciplines structure their discourses, invent and appropriate vocabulary, and make grammatical choices.

Contrasts in vocabulary learning

A major assumption of content area reading approaches is that students learn vocabulary similarly in different school subjects. It is easy to identify sets of words or terms that are associated with each content area. Mathematics, for example, might focus on terms such as *minuend*, *rational*, *quotient*, and *rhombus*; science on *acid*, *adaptation*, *buoyancy*, *nucleus*, and *fermentation*; social studies/history on *affirmative action*, *Middle Ages*, *melting pot*, *Jim Crow*, and *migration*; and literature on terms such as *frugal*, *prosaic*, *wary*, and *mundane*. According to textbooks aimed at teacher education in content area reading, the study skills that one would use to learn such terminology should be pretty much the same, no matter which set of words is targeted. Content reading textbooks, therefore, recommend that teachers guide students to make connections among concepts, construct graphic organizers, brainstorm, create semantic maps, sort words, rate knowledge of words, analyze semantic features of words, categorize or map words, develop synonym webs, and so on, for all subjects. But such strategies would not adequately recognize discipline-specific distinctions.

For example, an examination of the earlier presented science vocabulary terms reveals that the list is rife with words constructed from Greek and Latin roots. This structure is not unique to science words, of course, because most English words have such roots. Because science uses such words extensively and for a purpose, however, analyzing the Greek and Latin derivatives can provide particularly effective support in understanding science concepts. The purpose of constructing (and analyzing) words in this way is to offer a more complete and precise description of concepts than is possible with vernacular terms. Furthermore, such words are considered more resistant to meaning changes and to the morphological shifts that occur across time and across languages (Nybakken, 1959).

Generic, content area reading activities that encourage students to organize words, to use mnemonics, and to rehearse or repeatedly match words with their meanings can be effective study aids with science words, but they would be insufficient. The perspective of disciplinary literacy, in contrast, would emphasize that students should focus on how and why scientific terminology is created and how to use tools such as analysis of Latin and Greek roots to unpack often dense, but precise and recoverable, meanings. It would emphasize, for example, that relations among concepts are often signaled by the vocabulary of classificatory sciences, such as botany (e.g., *annual*, *biennial*, *perennial*) or biology (e.g., *mammal*, *carnivore*, *herbivore*). General study techniques, such as repetition and mnemonics, are the province of content area literacy in science. In contrast, the nature of scientific vocabulary and the specialized tools to construct and analyze vocabulary used within the sciences are the forte of disciplinary literacy.

History, in contrast to the sciences, does not focus so heavily on a Greek- and Latin-based nomenclature. Unlike science, history is rife with openly metaphorical terms.

Attempts at analysis of these words will not usually allow the reader to recover the meaning of the words, so a different approach would be more appropriate for studying history vocabulary. Technical terms in history are meant less to carry precise definitions than to unify extensive collections of weakly interwoven groups and events (the *Gilded Age*) or to express a particular perspective on a particular event or action (*Dark Ages* vs. *Middle Ages*). Such insights do not arise within a content area reading approach, but they are essential to a disciplinary approach to teaching subject matter.

As these examples show, although content area literacy might, quite reasonably, guide students to organize the vocabulary in a hierarchical manner that shows the relations among terms, a disciplinary approach might alternatively organize the vocabulary in terms of the authorial perspectives that it conveys. Both content area reading and disciplinary literacy may be able to support vocabulary learning, but they do so in different ways. It is our position that it is essential to understand these differences. To summarize differences in the area of vocabulary, although content area reading often does recommend the teaching of roots and combining forms, it is no more likely to tout this approach for science vocabulary than for the vocabulary of any other discipline. Significantly, no treatment of content area reading encourages teaching students the reasons why science vocabulary (in contrast to history vocabulary) is constructed in the ways that it is.

Other language differences

Similarly, functional linguistics has identified subtle, but profound, differences in the language used in the various disciplines (Fang & Schleppegrell, 2008; Halliday & Martin, 1993). "Secondary-level science, social studies, language arts, and mathematics use patterns of language that enable these disciplines to develop theories, engage in interpretation, and to create specialized texts" (Fang & Schleppegrell, 2008, p. 4). These patterns of language, or grammars, include differences not only in the nature of the technical vocabulary but also in points of view, attribution of causation and agency, passive and active voice, and other linguistic differences that undergird the nature and purpose of the disciplines.

As examples of linguistic analysis, Fang and Schleppegrell (2008) traced the use of nominalization within science; that is, the rendering of verbs and adjectives into nouns. For example, water may *evaporate* (verb) but scientists study and write about the process of *evaporation* (noun). Fang and Schleppegrell claimed that, by helping students to unpack this kind of noun, teachers can provide them with a better understanding of science text. Furthermore, Fang and Schleppegrell noted that such effort makes the text less abstract while giving students valuable insights into the nature of science and scientific communication. One of the major benefits attributed to nominalization is that it shifts the emphasis from social agents to natural agents in the consideration of causation, which is a central premise in most scientific concepts.

In contrast, history texts and literary texts are less likely to focus on nominalized subjects. Although they, too, address causation, understanding human agency (rather than physical cause–effect) is more central to their purposes. Again, as students examine varied disciplinary choices or relatively specialized patterns of language use, they may become better equipped to deal with the learning demands of the particular disciplines. Variations occur, of course, within social and scientific studies. For example, in most sciences, human agency is attenuated; whereas in ecology and environmental sciences, human causation is more important. In fields such as physics, biology, and chemistry, human agency is not a central concern, whereas in the environmental sciences, there is increasing interest in the role that is played by human actions and how they influence aspects of the environment.

Contrasts in levels of author awareness

Language differences revealed by linguistic analysis are only a part of what distinguishes

the disciplines. Another example of a disciplinary difference with profound implications for literacy is the reader's awareness of the author.

Research has shown (Shanahan, 1992; Shanahan, Shanahan, & Misichia, 2011) clear differences in how those in the various disciplines think about the author during reading. For example, in history reading, author is a central construct of interpretation (Wineburg, 1991, 1998). Historians are always asking themselves, "Who is this author and what bias does he or she bring to the text?" This is somewhat analogous to the lawyer's common probe, "What did he know and when did he know it?" Consideration of author is deeply implicated in the process of reading history, and disciplinary literacy experts have hypothesized that "sourcing," that is, thinking about the implications of author during interpretation, is an essential history reading process (Wineburg, 1991, 1998). Furthermore, studies show that author awareness can, at least under some circumstances, be taught to students in a way that improves their learning (Hynd-Shanahan, Holschuh, & Hubbard, 2004).

Although historians and history students must consider a text's authorial source to understand context, research has revealed a different pattern of reading for scientists (Shanahan et al., 2011). Our interviews with chemists have shown that they do rely on author but more as a topical or quality screen when determining which texts to read. In our research, chemists admitted that they consider the laboratory with which an author may be associated to determine whether a text would be worth the time to read. Once reading begins, unlike the historians, however, scientists try to focus their attention specifically on the text. Considerations of author, according to chemists, should play no part in the interpretation of text meaning, something revealed in their think-alouds both during reading and in postreading interviews. In our research, this pattern of intentionally ignoring the author was even more evident in the reading done by mathematicians, who explained,

almost stridently, that thinking about author would only be a distraction and that it could help in no way within the process of making sense of the text.

To bring the discussion of author full circle, whether the author should be considered interpretively has been a matter of great controversy within the field of literary criticism (English) for more than 50 years. Literary theorists have worked long and hard to minimize or discount entirely the author during interpretation (Brooks & Warren, 1938; Fish, 1980; Foucault, 1979; Gadamer, 1975; Rosenblatt, 1978; Wimsatt & Beardsley, 1946). Thus, some literary critics argue for the close reading of "authorless" texts, much in the fashion of the scientific or mathematical readings described earlier, whereas other critics allow for some consideration of the author, at least for making sense of the author's ideological stance, as in the historical readings already described.

These differences suggest that students must always read history with an eye to the author, while never reading mathematics that way. Students should reflect on authorship sparingly in science reading, though never to make sense of the text. When reading literature, they should sometimes interpret the author along with the text and, at other times, focus on the words of the literature with no consideration of the author at all.

The aim of disciplinary literacy is to identify all such reading- and writing-relevant distinctions among the disciplines and to find ways of teaching students to negotiate successfully these literacy aspects of the disciplines. It is an effort, ultimately, to transform students into disciplinary insiders who are able to approach literacy tasks with some sense of agency and with a set of responses and moves that are appropriate to the specialized purposes, demands, and mores of the disciplines.

Summary

In this section, we have described the newer ideas of disciplinary literacy in some detail. Content area literacy, on the contrary, has been around longer and is the focus of

dozens of teacher education textbooks. We should, therefore, be able to summarize the agenda of content area literacy proponents more efficiently.

It is evident from examining several decades of content area reading/literacy textbooks that the largely agreed-upon purpose of content area reading approaches is to provide students with a collection of generic reading strategies and study skills that will boost learning in all disciplines. For example, these approaches teach students to preview books through examination of tables of content and indices, preview of chapters through use of subheadings, and use of various print devices (e.g., italics, bold, font and point variations) to make sense of text. They promote the use of purpose setting and predicting, along with a rich collection of reading processes or strategies (e.g., visualization, summarization, clarification, questioning), and the use of particular study or teaching devices (e.g., Cornell note-taking, three-level guides, advance organizers).

A distinguishing feature is that the content area reading agenda aims not so much to help students to read history as an historian might but rather to read history with grasp of the information, using a set of generic learning or study tools that may be implemented in any subject. Thus, the focus of content area instruction is less on providing students with an insider's perspective of a discipline and ways of coping with the unique properties of particular disciplines than on providing students with tools to better remember the information regardless of the nature of the discipline.

SOURCES OF DISCIPLINARY LITERACY

Basically, disciplinary differences in literacy exist because of differences in the disciplines themselves. These differences are inherent in the varied phenomena that are the focus of each of the disciplines. Historians study past events through an examination of primary documents and secondary sources; whereas scientists analyze, especially, exacting experimental and observational evidence and logic.

Mathematicians focus on the implications of a set of axioms or self-evident truths or givens; whereas literature explores fictional or imaginational representations of human relations or development. These foundational differences in the disciplines require differences in texts and language and therefore differences in approaches to reading and writing.

The roots of the disciplinary literacy concept are threefold. They can be found in the historical development of content area reading, cognitive analyses of expert readers, and functional linguistics. The history of content area reading has been described in detail by Moore, Readence, and Rickelman (1983), and we rely heavily on that treatment. Moore et al. traced the history of content area reading research to the 1920s, when recognition of the importance of reading in content subjects began.

History of content and disciplinary literacy

From the beginning, the emphasis of content area reading was on instructional applications of the relation of reading to content subjects. For instance, the National Committee on Reading explored this topic in the classic *24th Yearbook of the National Society for the Study of Education* (Whipple, 1925), which provided guidelines and sample lessons emphasizing how to find answers to questions, follow directions, select major ideas, remember content, identify key words, self-question, and make notes.

As a result of the recognition of the importance of reading in school subjects accorded by the National Committee of Reading, researchers began exploring the issue. According to Moore et al. (1983), the early studies focused on the identification of important vocabulary in textbooks from various subjects, the availability and effectiveness of various instructional procedures, and correlations of comprehension measures based on general and subject specific texts. Moore et al. concluded, "Although these reports indicated various degrees of similarity between 'general' and 'specific' comprehension, all concluded

that the subjects presented distinct reading demands" (p. 429). Thus, despite the fact that their methods of research did not permit differences to be discerned, content area reading researchers typically promoted the notion that reading proficiency would be subject distinct. Furthermore, this idea of specialized reading has long been rhetorically honored in pedagogical treatments of content area reading, despite the fact that authors of content area reading textbooks for teachers have mainly endorsed general approaches to reading that were applicable generically across all subject matters.

Thus, the role that content area reading has played in the development of disciplinary literacy has largely been aspirational. It has pointed toward a theoretical conception of literacy processes specialized to particular disciplines while fostering a fundamentally different approach, based upon highly generalizable learning strategies or processes that could be easily adapted and used across different school subjects.

Expert reader studies

A more empirical source supporting disciplinary literacy approaches has emerged from expert reader studies completed over the past three decades in various disciplines (summarized by Shanahan et al., 2011). Drawing on the expert–novice paradigm from the cognitive sciences, these studies have used observations and think-aloud protocols to identify performance differences.

In this paradigm, the individuals who are particularly proficient in some skill, such as the literacy of a particular discipline, are identified. Then, these experts are asked to perform their skill (e.g., reading a science text) while thinking aloud. Less skilled individuals, perhaps students of the discipline, are observed in the same way, and differences are noted. A permutation on that approach is to compare the relative performances of experts from different fields of study. Such studies have focused on the reading of science (Bazerman, 1985; Latour & Woolgar, 1979; Shanahan et al., 2011); history (Rouet, Favart, Britt, &

Perfetti, 1997; Shanahan et al., 2011; Wineburg, 1991); and poetry (Peskin, 1998). They have gone a long way toward establishing the idea that disciplinary experts read differently from novices in their fields and, equally important, differently from experts in other fields.

For example, studies of the reading of physicists (Bazerman, 1985) revealed that they tended to pay particular attention to information that they did not already know and information that violated their expectations. The physicists separated reading to learn from critical reading, reserving the latter for work that was directly applicable to their own work. Historians were found to engage in sourcing (paying attention to the author), contextualization (connecting texts to the circumstances of the time), and corroboration (making comparisons across texts). Furthermore, unlike scientists, historians did not suspend their critical stance when they read information about which they knew little (Wineburg, 1991). As would be expected from studies using such an approach, this body of research identified strategies, perspectives, choices, and tendencies used by experts that involved a sense of self-awareness.

Functional linguistics

Another approach, and the third source for differentiating disciplinary literacy, arose from functional linguistics (Halliday & Matthiessen, 2004). Functional linguistics is concerned with the choices made available to language users by a grammar. The choices associate speakers' and writers' intentions with the grammar. Thus, analyses of functional linguists can reveal important insights about the nature and conduct of the language users of particular disciplines. Although functional linguistics focuses on grammar, it does so by considering contextualized and practical uses of language, making it useful for considering differences across disciplines.

The tools of functional linguistics have been used to analyze the discourses of science and history (Halliday & Martin, 1993; Schleppegrell, 2004; Veel, 1997; Wignell, 1994).

Earlier, we described how and why science texts employ nominalization; studies also have considered how such texts classify and describe phenomena (Halliday, 1994). History, in contrast, does not focus heavily on classification but, instead, construes actions and events, verbal and mental processes, descriptions, and background information (Schleppegrell, 2004). This means that verbs carry much of the meaning in history texts. Science texts, on the contrary, may be more tentative about conclusions than is history. This is because, in science, it is essential to be explicit about the degree or extent to which phenomena occur and scientists are more likely to present a mélange of mathematical equations, graphics, and prose. The reason for this explicitness and precision is that scientific claims are used to predict future reactions under similar conditions; even life and death can turn on the accuracy of scientific information. Because historians interpret events from partial documentation collected after the fact, the claims historians make often are not precise enough to determine the degree to which they are accurate. Historians strive instead to make claims plausible, given the evidence, and have different evidentiary constraints and standards from scientists.

Disciplinary literacy, then, is drawn from the largely unrealized aspirations of content area reading and, more substantively, from a growing body of cognitive and linguistic research that examines how disciplinary experts read and how language is structured in disciplinary texts. As such, the empirical roots of disciplinary literacy are not focused specifically on teaching, though many insights drawn from these studies are proving to be useful to literacy and disciplinary teaching. For example, Fang and Schleppegrell (2008) have developed several strategies on the basis of functional linguistics analyses for guiding students to make better sense of their textbooks. Shanahan and Shanahan (2008) have translated some of the expert reader analyses into practical classroom applications as well.

WHY DISCIPLINARY LITERACY MATTERS

At this stage, the body of scientific research evidence is not yet sufficient for demonstrating the effectiveness of disciplinary literacy instruction at improving either literacy achievement or subject matter success. Only a few studies testing the efficacy of such methods have been undertaken so far and with mixed results (De La Paz & Felton, 2010; Hynd-Shanahan et al., 2004; Nokes, Dole, & Hacker, 2007). Nevertheless, the approach is promising and needed for several reasons.

First, although content area reading methods have been successful in a plethora of research studies over a long history, they have not made great headway in the schools (O'Brien, Stewart, & Moje, 1995). This is despite the fact that most secondary level teachers are required to have some training in content area reading (Romine, 1996). Various reasons have been proposed for this, none more important than the idea that content area reading approaches have not appealed to most content area teachers. The resistance of pre- and in-service teachers to these methods, however, is well documented (Lesley, Watson, & Elliot, 2007; Moje, 1996; O'Brien & Stewart, 1990; Reehm & Long, 1996; Simonson, 1995; Stewart, 1990; Stewart, & O'Brien, 1989).

One explanation is that issues of affiliation and identity are important in the development of young teachers (Britzman, 1994; Varghese, Morgan, Johnston, & Johnson, 2005). Someone who aspires to be a science or mathematics teacher is much more interested in replicating what science or math educators usually do rather than appropriating routines from reading education. Also, even when subject matter teachers do attempt to use procedures and activities drawn from content area reading, they often find these approaches to be ill-fitting with regard to the purposes of their disciplines or the nature of the texts to be read. In addition, reading strategies are not usually integrated into the subject matter curriculum;

thus, teachers are left to determine how they can fit them on top of an already full agenda of instruction. Finally, teachers are usually motivated by the success of their students. The effectiveness of instructional procedures that often foster improvements only among the lowest performing students (Bereiter & Bird, 1985) may not be sufficient to be noticed or valued by content teachers.

Prior researchers have often interpreted the finding that strategies are more supportive of less skilled readers as evidence that readers are already using the strategies in question. However, this conclusion is not entirely consistent with the findings of think-aloud studies conducted with good readers. It also ignores the possibility of multiple routes to reading success. Nevertheless, instructional procedures that are only beneficial for some students are not as attractive to content teachers as would be approaches with more general benefit.

On the contrary, disciplinary reading approaches hold the promise of being more appealing than traditional content area reading approaches to content area teachers. Because the insights and strategies of disciplinary literacy are drawn from the disciplines themselves, a focus on this information does not pose the same challenges to teachers whose self-actualization is tied to their identities as mathematics, science, English, or history educators. If anything, the insights drawn from disciplinary literacy help these teachers to better understand the practices of their respective disciplines. Instructional practices that have been drawn from examinations of disciplinary texts and studies of successful-reader interactions with such texts seem more likely to produce procedures that facilitate the authentic learning demands of the disciplines than those practices that have been true of traditional content area reading routines.

The use of the so-called "generalizable" strategies of content area reading pose fundamental problems to learners, who must not only learn the strategies but must also recognize when they would be sensible to use in a particular discipline and then must adjust them to fit to the actual demands of the disciplinary texts. Such generalization can be very difficult in any learning situation. If disciplinary reading procedures require less stretching of strategies to texts, it stands to reason that these procedures would be more useful and more effective for secondary students to learn.

An open question with regard to the value of disciplinary literacy strategies has to do with whom these new approaches will be effective. As has been noted, traditional reading comprehension strategies and content area reading approaches have tended to be most beneficial for the lowest-proficiency readers, with lesser impact on results with average- and higher-proficiency readers. Perhaps, disciplinary strategies would have the same pattern of results, although given the specificity of disciplinary reading strategies and their emphasis on higher levels of thinking, this might not be the case. Further research is needed to make these determinations.

Many content area reading procedures seem to focus most heavily on getting students to engage with a text and to pay attention to the ideas expressed in the text. Less proficient readers are easily distracted and often do not think much or well about what they are reading; their focus often seems to be more on getting through the reading than trying to gain anything from the reading. Having students summarize what they are reading, ask themselves questions about the information in the text, and set purposes for their reading all offer the possibility that the students will, through the use of these tools, focus to a greater extent on what a text says and consequently, would benefit their learning. Proficient readers tend not to have the same problems with concentrating on the text information or trying to make meaning from it, though they do not always demonstrate the highest levels of interpretation. Strategies that guide one to think more effectively in a discipline-specific manner could guide such students to go beyond a superficial understanding and to grasp deeper and more sophisticated ideas. Thus, a student who could

retell the basic story in a piece of literature might be better able to construct a theme or to interpret multiple perspectives or points of view in short stories or novels as a result of applying insights drawn from that discipline. Similarly, a student who could retell many facts from a history book but fail to grasp the author's underlying argument might, through disciplinary strategies, be able to analyze such reasoning or even to construct his or her own arguments from the information. If subject matter teachers see their average and advanced students improving, gaining better purchase on the content of the class, it is possible that they would be more likely to sustain their efforts at using such approaches in instruction.

What about the lowest performing students who struggle to gain even the most basic information from their content texts? Will disciplinary strategies benefit the better readers while casting aside the basic needs of their less proficient peers? Again, it is impossible to answer such questions without empirical study. But there is a very real possibility that disciplinary literacy approaches would be successful even with less proficient readers. As we have indicated, instructional procedures that have usually been successful with such students have done so by stimulating them to engage with text. There is no reason to believe that encouraging more disciplinary engagements would be any less successful in that regard. Thus, disciplinary strategies might be more attractive to content area teachers because it is possible that such procedures will be facilitative of the learning of a wider distribution of students.

CONCLUSION

We believe that teaching disciplinary literacy will provide learning advantages to middle school and high school students. Various assessments have shown that secondary school students in the United States are not reading well enough to succeed in careers or college, with particular concerns about their readiness to participate in the so-called STEM (Science-Technology-Engineering-Mathematics) professions.

We also believe that students would make greater progress in reading the texts of history, science, mathematics, and literature if instruction provided more explicit guidance that helped them to understand the specialized ways that literacy works in those disciplines. This approach stands in stark contrast with the more widely espoused content area reading approaches, which promote reading strategies that can be used in all disciplines rather than facilitating students' awareness of the specialized nature of literacy in each discipline.

Supporting our position, we have presented evidence from expert–novice comparison studies and analyses of texts using the tools of functional linguistics. These sources have increasingly revealed the unique properties of the disciplines. Insights from those studies, we believe, hold important implications—and potential promise—for supporting more effective instructional approaches for teaching all students to read disciplinary texts. The importance of realizing this promise is now recognized in the new, aptly named "common core state standards for English language arts and literacy in history/social studies, and science/technical subjects," which have been adopted as the basic curriculum by more than 40 U.S. states (National Governors Association/Council of Chief State School Officers, 2010). Greater focus on disciplinary literacy is needed to help secondary level students achieve these standards.

REFERENCES

Bazerman, C. (1985). Physicists reading physics: Schema-laden purposes and purpose-laden schema. *Written Communication, 2*, 3-23.

Bereiter, C., & Bird, M. (1985). Use of thinking aloud in identification and teaching of reading comprehension strategies. *Cognition and Instruction, 2*, 131-156.

Britzman, D. P. (1994). Is there a problem with knowing thyself? Toward a poststructuralist view of teacher identity. In T. Shanahan (Ed.), *Teachers thinking, teachers knowing* (pp. 53-75). Urbana, IL: National Council of Teachers of English.

Brooks, C., & Warren, R. P. (Eds.). (1938). *Understanding poetry*. New York: H. Holt.

De La Paz, S., & Felton, M. K. (2010). Reading and writing from multiple source documents in history: Effects of strategy instruction with low to average high school writers. *Contemporary Educational Psychology, 35*, 174-192.

Fang, Z., & Schleppegrell, M. J. (2008). *Reading in secondary content areas*. Ann Arbor: University of Michigan Press.

Fish, S. (1980). *Is there a text in this class?* Cambridge, MA: Harvard University Press.

Foucault, M. (1979). What is an author? In J. V. Havari (Ed.), *Poststructuralist criticism* (pp. 141-160). Ithaca, NY: Cornell University Press.

Gadamer, H. (1975). *Truth and method* (J. C. B. Mohr, Trans.). New York: Seabury Press.

Graesser, A. C., McNamara, D. S., & VanLehn, K. (2005). Scaffolding deep comprehension strategies through Point&Query, AutoTutor, and iStart. *Educational Psychologist, 40*, 225-234.

Halliday, M. A. K. (1994). *Introduction to functional grammar* (2nd ed.). London: Edward Arnold.

Halliday, M. A. K., & Martin, J. R. (1993). *Writing in science: Literacy and discursive power*. Pittsburgh, PA: University of Pittsburgh Press.

Halliday, M. A. K., & Matthiessen, C. (2004). *An introduction to functional grammar* (3rd ed.). London: Hodder Education.

Herber, H. L. (1970). *Teaching reading in content areas.* Englewood Cliffs, NJ: Prentice-Hall.

Hynd-Shanahan, C., Holschuh, J., & Hubbard, B. (2004). Thinking like a historian: College students' reading of multiple historical documents. *Journal of Literacy Research, 36*, 141-176.

Latour, B., & Woolgar, S. (1979). *Laboratory life: The social construction of scientific facts*. London: Sage.

Lesley, M., Watson, P., & Elliot, S. (2007). "School" reading and multiple texts: Examining the metacognitive development of secondary-level preservice teachers. *Journal of Adolescent & Adult Literacy, 51*, 150-162.

Magliano, J. P., Todaro, S., Millis, K., Wiemer-Hastings, K., Kim, H., & McNamara, D. S. (2005). Changes in reading strategies as a function of reading training: A comparison of live and computerized training. *Journal of Educational Computing Research, 32*, 185-208.

Moje, E. B. (1996) "I teach students, not subjects": Teacher–student relationships as contexts for secondary literacy. *Reading Research Quarterly, 31*, 172-195.

Moore, D. W., Readence, J. E., & Rickelman, R. J. (1983). An historical exploration of content area reading instruction. *Reading Research Quarterly, 18*, 419-438.

National Governors Association/Council of Chief State School Officers. (2010). *Common Core State Standards for English language arts & literacy in history/social studies, science, and technical subjects*. Retrieved January 2, 2012, from http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf

National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups*. Washington, DC: U.S. Government Printing Office.

Niles, O. S. (1965). Developing essential reading skills in the English program. In J. A. Figurel (Ed.), *Reading and inquiry*. (pp. 35-43) Newark, DE: International Reading Association.

Nokes, J. D., Dole, J. A., & Hacker, D. J. (2007). Teaching high school students to use heuristics while reading historical texts. *Journal of Educational Psychology, 99*, 492-504.

Nybakken, O. E. (1959). *Greek and Latin in scientific terminology*. Ames: Iowa State University Press.

O'Brien, D. G., & Stewart, R. A. (1990). Preservice teachers' perspectives on why every teacher is not a teacher of reading: A qualitative analysis. *Journal of Reading Behavior, 22*, 101-129.

O'Brien, D. G., Stewart, R. A., & Moje, E. B. (1995). Why content literacy is difficult to infuse into the secondary school: Complexities of curriculum, pedagogy, and school culture. *Reading Research Quarterly, 30*, 442-463.

Peskin, J. (1998). Constructing meaning when reading poetry: An expert–novice study. *Cognition and Instruction, 16*, 235-263.

Reehm, S. P., & Long, S. A. (1996). Reading in the mathematics classroom. *Middle School Journal, 27*, 35-41.

Robinson, D. (1961). Study skills for superior students in secondary schools. *The Reading Teacher, 25*, 29-33.

Romine, B. G. (1996). Reading coursework requirements for middle and high school content area teachers: A U.S. survey. *Journal of Adolescent & Adult Literacy, 40*, 194-198.

Rosenblatt, L. (1978). *The reader, the text, and the poem*. Carbondale, IL: Southern Illinois Press.

Rouet, J. F., Favart, M., Britt, M. A., & Perfetti, C. A. (1997). Studying and using multiple documents in history: Effects of discipline expertise. *Cognition and Instruction, 15*, 85-106.

Schleppegrell, M. J. (2004). *The language of schooling: A functional linguistics perspective*. Mahwah, NJ: Erlbaum.

Shanahan, C., Shanahan, T., & Misichia, C. (2011). Analysis of expert readers in three disciplines: History, mathematics, and chemistry. *Journal of Literacy Research, 43*, 393-429.

Shanahan, T. (1992). Reading as a conversation with an author. In M. Pressley, K. R. Harris, & J. T. Guthrie

(Eds.), *Promoting academic competence and literacy in school*. (pp. 129-148) San Diego, CA: Academic Press.

Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content area literacy. *Harvard Education Review*, *78*, 40-59.

Simonson, S. D. (1995). A historical review of content area reading instruction. *Reading Psychology*, *16*, 99-147.

Stewart, R. A. (1990). Factors influencing preservice teachers' resistance to content area reading instruction. *Reading Research and Instruction*, *29*, 55-63.

Stewart, R. A., & O'Brien, D. G. (1989). Resistance to content area reading: A focus on preservice teachers. *Journal of Reading*, *32*, 296-401.

Vacca, R. T., & Vacca, J. L. (2002). *Content area reading* (7th ed.). Boston: Allyn & Bacon.

Varghese, M., Morgan, B., Johnston, B., & Johnson, K. A. (2005). Theorizing language teacher identity: Three perspectives and beyond. *Journal of Language, Identity, and Education*, *4*, 21-24.

Veel, R. (1997). Learning how to mean—scientifically speaking: Apprenticeship into scientific discourse in the secondary school. In F. Christie & J. R. Martin (Eds.), *Genre and Institutions: Social processes in the workplace and school* (pp. 161-195). London: Cassell.

Whipple, G. M. (Ed.). (1925). *Report of the National Committee on Reading* (Twenty-fourth Yearbook of the National Society for the Study of Education, Part I). Bloomington, IL: Public School Publishing.

Wignell, P. (1994). Genre across the curriculum. *Linguistics and Education*, *6*(4), 355-372.

Wimsatt, W. K., & Beardsley, M. C. (1946). The intentional fallacy. *Sewanee Review*, *54*, 468-488.

Wineburg, S. S. (1991). On the reading of historical texts: Notes on the breach between school and academy. *American Educational Research Journal*, *28*, 495-519.

Wineburg, S. S. (1998). Reading Abraham Lincoln: An expert/expert study in the interpretation of historical texts. *Cognitive Science*, *22*, 319-346.