

Disciplinary Literacy From a Speech–Language Pathologist’s Perspective

**Barbara J. Ebren, Kimberly A. Murza, and
Melissa D. Malani**

Disciplinary literacy is an increasingly popular focal area in adolescent literacy. In disciplinary literacy, the discourse features of specific knowledge domains (e.g., literature, history, science, and math) assume major importance in understanding and constructing meaning in each discipline. Because language plays a significant role in disciplinary literacy, speech–language pathologists (SLPs), as professionals with expertise in language, can contribute in important ways to adolescents’ proficiency in this area. This is especially true with adolescents who struggle, for whom difficulty understanding or manipulating language may be at the root of their problems. Work in disciplinary literacy is consistent with roles and responsibilities of SLPs in schools, as outlined by the American Speech-Language-Hearing Association (2010). The authors explore specific ways in which SLPs may address adolescent literacy by working directly with adolescents who struggle or with their teachers to support classroom instruction in specific content domains. A major concept presented is that adolescents who struggle are likely to need work on more fundamental language and literacy elements in addition to those germane to specific disciplines. **Key words:** *adolescent literacy, disciplinary literacy, language disorders, reading disabilities, roles of speech–language pathologists, secondary schools, struggling adolescents*

THE CURRENT conversation among literacy educators about disciplinary literacy should resonate with speech–language pathologists (SLPs), as well as other specialists whose focus is on language. The idea that each academic discipline has its own way of making meaning and communicating that meaning (Heller & Greenleaf, 2007; Lee & Spratley, 2009; Shanahan & Shanahan, 2008, 2012), which is the essence of disciplinary literacy, highlights the importance of

language in academic learning. As Halliday (2004) maintained, language drives knowledge. It is therefore impossible to discuss acquisition of knowledge in a specific domain without addressing language. In fact, the primacy of language as an issue in pedagogy was captured by Fang, Schleppegrell, and Cox (2006), when they called for “a linguistically informed literacy pedagogy that foregrounds the role of language in construing knowledge and value in school subjects” (p. 249).

That SLPs should be involved in language because it affects academic learning has been a subject of conversation in the literature for some time (e.g., Culatta & Merritt, 1998; Ehren, 1989; Miller, 1989; Nelson, 1989; Wallach & Butler, 1994) and remains a critical aspect of SLPs’ scope of practice in working with children and adolescents. In policy documents, the American Speech-Language-Hearing Association ([ASHA], 2010) has promulgated roles and responsibilities of SLPs in curriculum for a variety of children and

Author Affiliation: Department of Communication Sciences and Disorders, University of Central Florida, Orlando.

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

Corresponding Author: Barbara J. Ebren, EdD, CCC-SLP, University of Central Florida, Orlando, FL 32816 (Barbara.Ebren@ucf.edu).

DOI: 10.1097/TLD.0b013e318244e8d4

adolescents that include substantive work in supporting curriculum mastery:

SLPs provide a distinct set of roles based on their focused expertise in language. They offer assistance in addressing the linguistic and metalinguistic foundations of curriculum learning for students with disabilities, as well as other learners who are at risk for school failure, or those who struggle in school settings. (p. 1)

Therefore, it makes sense to maintain that SLPs can be valuable contributors to disciplinary literacy, especially for students who struggle.

The purpose of this article is to explore disciplinary literacy from an SLP perspective by addressing the following questions: What features of disciplinary literacy do SLPs need to know? How does disciplinary literacy relate to adolescents who struggle with literacy? How might disciplinary literacy affect SLPs' roles and responsibilities in working with adolescents? How can SLPs promote disciplinary literacy?

DISCIPLINARY LITERACY FEATURES

To become competent in a number of academic content areas requires more than just applying the same skills and comprehension strategies to new kinds of texts. It requires skills, knowledge, and reasoning processes that are specific to particular academic disciplines (Heller & Greenleaf, 2007). The idea of focusing on literacy within specific academic disciplines is not new. Addressing reading and writing requirements in the content areas has been a long-standing issue in middle and high schools (Gray, 1925; Herber, 1970). However, as Shanahan (2010) pointed out, considering literacy *in* a discipline has a different meaning from considering the literacy *of* that discipline. The difference in prepositions is important. Addressing literacy *in* a discipline has typically meant applying a general set of skills and strategies to that subject area (Draper, 2008; McKenna & Robinson, 1990; Vacca & Vacca, 2005). This approach has been known by many names, for example,

content literacy (Cooter & Flynt, 1996; O'Brien, Stewart, & Moje, 1995; Richardson & Morgan, 1990), literacy in the content areas (Chapman & King, 2003; Crawley & Mountain, 1995), and reading and writing across the curriculum (Alvermann & Phelps, 2005). However, what is targeted as disciplinary literacy, sometimes called discipline specific literacy, is something quite different. Focusing on the literacy *of* a domain means paying attention to the unique features of the communication patterns used by the professionals in that field and, therefore, the demands placed on neophytes attempting to acquire and manipulate knowledge in that discipline.

Several authors have provided a description of the specific literacy demands of history, science, math, and literature (e.g., Bullock, 1994; Fang et al., 2006; Monte-Sano, 2010; Otero, Leon, & Graesser, 2002; Perfetti, Britt, & Georgi, 1995; Yore & Treagust, 2006). Heller and Greenleaf (2007) noted several features of various disciplines. The literacy of history requires students to pay particular attention to the author and source to identify bias and make judgments about the trustworthiness of the text. In contrast, the literacy of science does not put as much emphasis on the author. For students to fully comprehend science texts, they must be able to transform information from one form to another (e.g., written form to diagrams or formulas). In addition, students must explicitly understand different types of texts such as formulas, graphs, diagrams, charts, or pictures to fully grasp many of the concepts discussed in the text. The literacy of math requires students to pay careful attention to each word in a text because each is critical to understanding. Students must read and reread math texts for understanding; content-specific vocabulary knowledge is critical. In addition, students cannot read math for the gist, as they are able to in the history and literature domains. The literacy of literature requires students to pay close attention to the narrator and follow characters closely. A solid ability to draw inferences and understand the author's

purpose is critical to comprehension of literature.

In addition to these broad differences among the disciplines, more language-specific differences exist. As children move from early elementary grades to secondary grades, they encounter more and more expository text in their disciplines. Students familiar with the literate style of storybooks learn story grammar that helps them understand the macrostructure of narratives. As they encounter higher level literature texts, this macrostructure becomes increasingly complex and often fails to follow the typical episodic structure. Students in literature courses must also deal with increasingly complex literate language riddled with elaborated noun phrases and complex structures (Fang, 2012; Fang et al., 2006).

Expository text in disciplines such as history, science, and math deal with more specialized topics and abstract concepts. These texts are generally more authoritative, technical, and abstract due to the nominalization of nouns in the text (Fang et al., 2006). Nominalization describes the act of turning more commonly used verbs or adjectives (e.g., stabilize) into less familiar nouns or noun phrases (e.g., destabilization). Although this structure allows authors to present ideas succinctly and refer to previously presented ideas in different ways, it can cause difficulty for students.

Because nominalization enables a lot of information to be packed into a nominal element, students have to process more ideas per clause when they read academic texts and are expected to incorporate more information into the nominal elements of the texts they write. (Fang et al., 2006, p. 254)

DISCIPLINARY LITERACY FOR ADOLESCENTS WHO STRUGGLE

Understanding the literacy demands in various disciplines and translating those demands into educational practice are two related but different matters, especially when considering adolescents who struggle with academic learning because of literacy difficulties. Several authors have expressed strong advocacy for moving to a disciplinary literacy approach

(Fang, 2006; Lee & Spratley, 2009; Moje, Overby, Tysvaer, & Morris, 2008; Shanahan & Shanahan, 2012). For the most part, the implication appears to be that such a focus would take the place of other approaches to adolescent literacy, such as teaching general reading comprehension strategies applied across all domains.

Although the arguments supporting discipline-specific literacy are persuasive, a critical question is whether such a focus alone is sufficient for adolescents who struggle. More specifically, from a language standpoint, can educators assume that approaches to help students gain entry to specific disciplines are at a level of complexity that students who struggle can handle and that they have the foundational skills and strategies upon which to build more advanced domain literacy proficiency? What do we know about the language and literacy difficulties adolescents face to inform decisions about addressing disciplinary literacy?

Language and literacy difficulties

In addressing language and literacy difficulties, a significant number of students are involved. Recent assessment data show that only one third of the nation's eight graders are reading at a level proficient enough to master difficult, and often inconsiderate, academic texts (National Center for Education Statistics, 2009). The remaining two thirds of eight graders are reading at or below the basic level, a level that corresponds to only partial mastery of knowledge and skills necessary to succeed academically (National Center for Education Statistics, 2009). This trend is not only for our nation's eight graders. Unfortunately, only 39% of our 12th graders are reading at a proficient level (National Center for Education Statistics, 2010). Students' performance in writing is similar. National data show that only one third of 8th graders and 24% of 12th graders demonstrate proficiency in writing (Salahu-Din, Persky, & Miller, 2008).

Lack of experience with school-based language in meaningful contexts has been cited

as a major source of academic failure (Snow, Burns, & Griffin, 1998). Adolescents who struggle with academic literacy might be considered in two groups related to the roots of their language difficulties. The first group of students struggle because they lack the foundational language skills necessary to fully access the curriculum (Catts & Kamhi, 1999; Snow et al., 1998). The other group of students are not achieving at high levels because they lack sophistication in the literacy of the discipline (Kamil et al., 2008). In either case, a focus on language is warranted.

Research has consistently demonstrated a reciprocal relationship among listening, speaking, reading, and writing (Bradley & Bryant, 1983; Catts & Kamhi, 2005; Englert & Thomas, 1987; Gillon & Dodd, 1995; Hiebert, 1980; Kroll, 1981; Ruddell & Ruddell, 1994), with foundational language underpinning all of these processes. However, language learning in adolescents is a complex process (Nippold, 1993) and difficulties with foundational language may potentially impede literacy processes. Therefore, problems with higher level language may need to be addressed with adolescents.

During adolescence, language growth in syntax and semantics has important implications for academic learning. As students progress academically, they are required to comprehend and produce increasingly complex sentences (Scarborough, 1990), requiring them to attend to the syntax of the sentence, the meanings of the individual words, and the ways in which the words are combined (Scott, 2004). Some features, such as subordination, can be difficult for adolescents; for example, the use of verb phrases in the place of adverbial clauses (Nippold, 1993): "Joseph had not gone above two miles, *charmed with the hope of shortly seeing his beloved Fanny*, when he was met by two fellows in a narrow lane, and ordered to stand and deliver" (Spargo, 1989, p. 61).

At this level of sophistication, manipulating complex language requires syntactic awareness that some adolescents may not have (Flood & Menyuk, 1983). Syntactic awareness,

among other skills, enables students to understand that there are many ways to say or write the same thing (Scott, 2004). Middle and high school students are often asked to put ideas in their own words, that is, to paraphrase orally and in writing. To engage in paraphrasing successfully, in addition to understanding that ideas and concepts can be expressed in multiple ways, students would need to know synonyms for words and how to use and manipulate a variety of syntactic patterns (Ehren, 2006).

Semantically, adolescents are exposed to figurative language with increasing frequency (Nippold, 1993). Comprehending text with abstract or multiple meanings is typically more difficult (Nippold & Fey, 1983). Research shows that some adolescents particularly struggle with comprehending figurative language (Qualls, Lantz, Pietrzyk, Blood, & Sheffner Hammer, 2004; Seidenberg & Bernstein, 1986).

Increasingly, implicit oral and written discourse in the middle and high school grades requires adolescents to make inferences. This process is critical to their academic and social success (Moran & Gillon, 2005). Foundational language skills such as accessing background information, determining textual clues, and self-questioning are essential to making accurate inferences. Research suggests that there are some adolescents who struggle with making inferences despite accurate word decoding skills (Oakhill, 1994; Oakhill, Cain, & Yuill, 1998; Yuill & Oakhill, 1991).

Research also suggests that adolescents' morphological awareness plays a role in academic success (Carlisle, 2004). Students who are morphologically aware understand that analyzing parts of an unknown word can help determine its meaning. Morphologically complex words are found throughout adolescent's textbooks. Understanding these morphologically complex words requires a student to attend to the lexical, semantic, and syntactic information the word provides (Carlisle, 2004). Research suggests that some adolescents struggle in this area (Carlisle, 1987; Leong, 1989) and morphological

awareness supports written language achievement (Berninger, Abbott, Nagy, & Carlisle, 2010).

General versus specific strategies

To become highly literate, adolescents must be strategic in their reading and writing. Evidence over many years supports the notion that adolescents who struggle benefit from explicit strategy instruction (Edmonds, et al., 2009; Gersten, Fuchs, Williams, & Baker, 2001; Kamil et al., 2008; Malone & Mastropieri, 1992; Pressley, Borkowski, & Sullivan, 1985; Pressley et al., 1992; Scammacca et al., 2007; Schumaker, Deshler, Nolan, & Alley, 1994; Torgesen et al., 2007). If the focus shifts from a general approach to literacy across disciplines to more discipline-specific literacy, what kinds of strategies should be taught to adolescents who struggle?

A number of strategies have been identified as being effective in improving students' comprehension of texts in general, although it remains to be seen whether more discipline-focused strategies are more beneficial to adolescents. General comprehension strategies that have an evidence base include:

having students summarize main ideas both within paragraphs and across texts, asking themselves questions about what they have read, paraphrasing what they have read, drawing inferences that are based on text information and prior knowledge, answering questions at different points in the text, using graphic organizers, and thinking about the types of questions they are being asked to answer. (Kamil et al., 2008, p. 17)

Some research suggests that the active participation of students in the comprehension process may be more important than the actual comprehension strategy they choose to use (Gersten et al., 2001; Pressley, Levin, & McDaniel, 1987).

Although, in a disciplinary literacy context, these general skills and strategies may not be sufficient by themselves to render students highly proficient in accessing each discipline, they should not be ignored, in particular with students who struggle with foundational skills

and strategies. Perhaps, they may be applied differently in given subjects but they form a corpus of competencies that students should have in their repertoire if they are to be successful. For example, reading requirements across disciplines include learning new terms and phrases, paying close attention to detail, working through long, complex sentences and in other than literature, working with writing that sounds nothing like familiar spoken English; writing requirements across disciplines include generating ideas, organizing what students intend to write, writing more than one draft and citing sources (Heller & Greenleaf, 2007). For adolescents who struggle, educators must first ask if they have these basics and, if not, strengthen this foundation.

IMPLICATIONS FOR SLPs' ROLES AND RESPONSIBILITIES

Given the idea of disciplinary literacy and the difficulties educators can expect adolescents to encounter in acquiring it, how might SLPs be involved? The roles and responsibilities policy documents from ASHA (2010) provide a framework within which to view disciplinary literacy for SLPs. The ASHA's professional issues statement, "Roles and Responsibilities of Speech-Language Pathologists in Schools," designates roles in the following categories: critical roles, range of responsibilities, collaboration, and leadership.

Critical roles

"SLPs have integral roles in education and are essential members of school faculties" (ASHA, 2010, p. 1). If disciplinary literacy is to be an important area of work in secondary schools, SLPs who serve in these settings will have to capture it on their own radar screens and then help put it on the radar screens of their colleagues (Ehren, 2010). Because an in-depth understanding of language is critical to disciplinary literacy, as professionals with focused expertise in language, SLPs are essential to supporting adolescents who struggle with language and literacy as well as to supporting teachers in addressing the language

correlates of their respective disciplines. (Specific suggestions for this work follow in the next major section.)

Range of responsibilities

SLPs perform a myriad of tasks including those revolving around prevention, assessment, and intervention. Because students with a variety of language impairments are likely to encounter difficulties with domain-specific literacy, the SLP should address this area with students whom they are seeing. This work may include attention to basic language and literacy competencies; however, it should also address specific discipline literacy skills and strategies.

As SLPs become more involved with Response to Intervention (RTI) efforts in their schools and districts, they may be called upon to assist in a variety of activities with adolescents who struggle with academic achievement related to literacy difficulties (Ehren & Whitmire, 2009). As awareness of disciplinary literacy requirements grows in secondary schools, it is likely that failure to engage successfully with the literacy of the various disciplines may be included in progress monitoring and instruction intervention efforts. SLPs will be valuable contributors in these problem identification and problem-solving activities and may be involved in a variety of levels or “tiers” of instruction/intervention in RTI.

Collaboration

In general, work in schools requires SLPs to partner with others to meet students’ needs (ASHA, 2010). This requirement is a driving force in considering roles with disciplinary literacy. Ongoing and substantive work with teachers is perhaps one of the most important venues to consider. This is true for two important reasons. First, it is questionable whether secondary teachers have a sufficient knowledge of language to engage in the language-focused instruction required to teach the literacy proficiency of their domain, as outlined by Fang and Schleppegrell (2010). Second, an equally important reason is that most SLPs will not have sufficient domain knowledge across

multiple disciplines to address student needs without the collaboration of a content expert.

Another kind of collaboration has been suggested by Ehren and Laster (2010) and Goetze, Laster, and Ehren (2010). The complexities of adolescent literacy call for a special partnership among specialists who share an interest and expertise in language; namely, the SLP, reading specialist, and English language learner teacher. Therefore, work at a school should involve collaboration among these professionals to identify the most effective and efficient ways to work together on behalf of students and teachers to advance disciplinary literacy.

Leadership

As SLPs provide direction in defining their roles and responsibilities and in ensuring appropriate services to students (ASHA, 2010), they can step out in front to communicate the importance of disciplinary literacy and its place within Common Core State Standards (Zygouris-Coe, 2012). Perhaps, the place to begin is to increase awareness on the part of secondary educators of the role of language in learning and to dispel myths regarding adolescent language. For example, SLPs might refute the common notion that students “learn to read” through the third grade and then “read to learn” from fourth grade through high school graduation. To cast these processes as dichotomous is inaccurate. Especially, as one considers disciplinary literacy, it is clear that adolescents are continuing to learn how to read in the disciplines (Torgesen et al., 2007) because they are increasingly exposed to new, more advanced, dense, and technical texts with higher level vocabulary and content. SLPs might actually lead the conversation in middle and high schools about the importance of ongoing attention to learning to read in specific disciplines. They might also conduct professional development to increase knowledge of text structures in specific domains. (See Ehren, Lenz, & Deshler, 2004, for a discussion of other myths in adolescent literacy.)

WAYS TO ADDRESS DISCIPLINARY LITERACY

According to Shanahan and Shanahan (2008), discipline-specific literacies are difficult to learn because there are not many parallels in oral language use and they have to be applied to difficult texts. They would be even more difficult to learn for adolescents who struggle with basic components of language and literacy. Therefore, sensitivity to the language and literacy status of adolescents, as well as to the demands of disciplinary texts, is required to facilitate acquisition of domain knowledge through engagement with the text of a discipline. The previous section included the suggestion that SLPs' roles and responsibilities in disciplinary literacy involve work with adolescents, especially those who struggle with language, and work with secondary teachers. Therefore, this section will address ways for SLPs to scaffold learning with students and to support teachers' classroom instruction. It should be noted that little evidence is available to date supporting the effectiveness of techniques specific to disciplinary literacy, and a great deal of research is needed in this area. However, SLPs can draw upon what they do know about language and literacy as a start and encourage further study.

Employ backward design

As Wiggins and McTighe (1998) suggested, SLPs should start with the end in mind. For adolescents, the goal is to engage in multiple literacies to meet core academic standards in literature, history, math, and science. For some students, the work might have to include the basic or intermediate literacy that Shanahan and Shanahan (2008) described with the corresponding language underpinnings that Ehren (2006) described. For example, adolescents may still be struggling with identifying the main idea in any paragraph, regardless of the discipline. A language underpinning at issue may be understanding how to synthesize central meaning from words or even more basically what a "main" idea actually is. The caution is to avoid focusing on

basic elements alone. Work in domain discourse should not be set aside with students who struggle. Rather, SLPs might use a multipronged approach to language and literacy learning to meet specific adolescents' needs. Thus, in addition to addressing the underpinnings of main idea, an SLP might also instruct students on how main ideas are expressed in specific disciplines or even how relatively important they are in one discipline over another, noting disciplines that favor details over big ideas, such as math.

SLPs should help teachers identify the students whose struggle with disciplinary literacy is related to more fundamental problems with language and literacy processes, as well as the students who have basic and intermediate literacy but may need more explicit scaffolding for the complex language demands in specific discipline texts. SLPs may provide that additional scaffolding directly with some students or assist classroom teachers in providing it.

Focus on the metas

Whether working with students directly or with their teachers, SLPs should promote metacognitive and metalinguistic approaches. In other words, they should surface the importance of planful engagement with text before, during, and after reading (metacognitive component), as well as an analysis of language to support text comprehension (metalinguistic component).

Consider that most adolescents have to engage in the literacy of at least six different disciplines in a day! For students, especially those with disabilities who may have task-switching difficulties, this may be extremely difficult. Therefore, teachers need to orient students explicitly to each class period. For example, a math teacher might say, "Here we are in geometry where we are listening, speaking, reading, and writing like mathematicians. Remember to look at the bulletin board highlighting the key features of the communication of mathematicians, including the language patterns we use."

Students need to understand how language makes meaning in content-area texts and how the important meaning of school subjects is conveyed by language. Fang and Schleppegrell (2010) suggested a functional language analysis approach to disciplinary literacy. Functional language analysis is certainly a way to focus on the language features of text essential to understanding disciplinary-specific text structures. A serious consideration with this approach is whether widespread use by secondary teachers is possible without intensive professional development. Furthermore, it is quite possible that secondary teachers lack the specific metalinguistic awareness of their discipline's discourse to engage students in this kind of analysis. However, engaging in this analysis would be within the purview of SLPs, given their expertise in language. SLPs can help teachers do this analysis themselves so that they can teach students to do it. They might model for teachers how to engage students in meta-processing of disciplinary texts. A series of professional development sessions with teachers to orient them toward a meta-approach to their discipline might be a way to begin.

Attend to reciprocity among language processes

In working with adolescents who struggle or in assisting teachers, SLPs should integrate listening, speaking, reading, and writing. For SLPs to impact academic learning, work that they do in oral language should be accompanied by work with written language, and vice versa. For example, to assist students with acquiring a variety of morphological structures, SLPs might “play” with the structures orally to reveal phonological changes that occur with morphological changes and also write the structures to understand the orthography involved. If students are studying *democracy* in history, SLPs might talk and write various forms of the word—democratic, democratize, democratization—“playing” with different syntactic patterns using the word:

In our *democracy*, we value individual freedom. Our *democratic* government protects individual

freedom. People in other countries try to *democratize* their governments to promote individual freedom. The *democratization* of a government often leads to the protection of individual freedom.

It goes without saying that the targeted words should be those that the students are encountering in their classes.

In working with secondary teachers, SLPs should emphasize the importance of oral language experiences as companions to reading and writing. One suggestion is to encourage teachers to provide opportunities for extended discussion of text meaning (Kamil et al., 2008) and perhaps to model ways to do that. One approach is “text-based collaborative learning” (Biancarosa & Snow, 2006). Biancarosa and Snow suggested interactive dialogue (i.e., listening and speaking) around content knowledge and clarified that when students work in small groups, they should not just discuss a topic but rather interact around a text. This approach requires teachers to prepare carefully for the discussion by selecting engaging materials and developing stimulating questions. Furthermore, providing a task or discussion format that students can follow when they discuss text in small groups and engaging in specific practice in the use of the format and process would be important parts of this instruction.

Judiciously select text for students who struggle

Educators who work with adolescents who struggle often rely on simplified texts to provide access to knowledge in the domain. This issue is germane to SLPs, not because they are responsible for students' domain knowledge but because they are in a position to advise others. There is evidence that simplifying text can improve comprehension. Abrahamsen and Shelton (1989) found that simplifying sentences semantically and syntactically greatly improved comprehension of social studies text for adolescents with learning disabilities. However, in light of disciplinary literacy, an important question is whether watering down text, or “sanitizing”

it, solves the problem of access to complex domain knowledge in specific disciplines. One argument against such an approach is that the volume of reading material in secondary schools would make simplifying text impractical. Perhaps, most important is the possibility that such simplification would distort the meaning of complex ideas (Otero et al., 2002). Furthermore, students will not gain experience with the kind of complex semantic-syntactic structures used in specific disciplines with sanitized texts. Therefore, although reading lower level texts might provide reading experiences at independent reading levels, a practice encouraged by reading experts (Guthrie & Davis, 2003; Ivey, 1999a, 1999b), it will not by itself solve the problem of disciplinary literacy.

Focus on the language and related cognitive underpinnings of a discipline

As specialists in language, SLPs can offer valuable assistance to students directly or to teachers in identifying the underlying language demands of discourse in the disciplines with which adolescents are struggling. What follows are selected examples of language and relative cognitive underpinnings in the disciplines of literature, history, math, and science. These examples do not constitute an exhaustive analysis. More detailed information can be found in Fang (2012).

The literacy of literature

The more complex structures of higher level literature texts force adolescents to make inferences about the story based on the narrator's point of view, as well as motivations of characters, to comprehend the story's plot. Inference-making is a higher level language process that requires foundational language skills and metacognitive abilities, including the use of strategies (Fritschmann, 2006; Snow, 2002). To be strategic, students must be aware of the necessity to make inferences and actively read the text. Students must also understand the different categories of inferences, such as inferences about theme, character condition, or author's intent, so that they can ask appropriate questions as they

read. Understanding the syntax of question formulation is necessary for this task. In addition, students must be able to activate background knowledge to integrate with textual cues to come to conclusions about texts.

The literacy of history

Vocabulary is a key language underpinning necessary for successful comprehension of the literacy of history. Students must be able to understand new words, generate meaning from context, and recognize dated terms. Shanahan and Shanahan (2008) noted that, although the vocabulary of history was not highly technical or complex, the vocabulary was found to be a challenge when reading history texts due to obsolete language, metaphorical terms, and academic vocabulary. For example, take the sentence, "African Americans held in slavery had no political rights at all" (Carrington, Collins, Iriye, Martinez, & Stearns, 2005, p. 311). In this instance, the word *rights* is used in an academic context that may be less familiar. Students need to understand that the word *rights* means *principles of freedom or entitlement* and not an alternate meaning of *correct*.

The literacy of math

In math, each word must be understood specifically in service to that particular meaning. Words that can be interchanged in other texts may have very different meanings in math texts. For example, a *radical* refers to a root sign such as $\sqrt{\quad}$. This meaning of *radical* is very different from the general meaning of *radical* (*fundamental* or *extreme*).

Another issue is the density of mathematical text. Take, for example, this seventh-grade text: "The base and height are perpendicular dimensions. Since one angle of this triangle is a right angle, the base and height are the perpendicular sides, which are 4 cm and 3 cm long" (Hake & Saxon, 2004, p. 253). Students would need to "unpack" the sentences of this excerpt to fully understand the meaning; that is, identify the kernel ideas conveyed by the syntactic structures (Ehren, 2009). The second sentence in this excerpt starts with a dependent clause beginning with a

subordinating conjunction (i.e., *Since*). It also contains a relative clause at the end that makes the text more difficult to follow (*which are . . .*). A student would need to identify the key ideas in the second sentence in order to manipulate the syntax without changing the meaning. For example, “The base and height of the triangle have perpendicular sides. We know this because one of the angles is a right angle. In this example, the sides are 4 cm and 3 cm long.”

The literacy of science

The ability to “unpack” sentences is a necessary language underpinning for literacy in all disciplines but arguably most necessary for the literacy of science (Fang, 2006) due to the highly technical and dense nature of science texts. In addition, with the heavy reliance on graphs and pictures in science, much text is interrupted with references to figures, graphs, charts, or pictures; for example, as in the following excerpt from a seventh-grade text: “Scientists draw models, such as the one shown in Figure 6, that illustrate their hypotheses” (Todd, Bowman, & Zapanta, 2007, p. 169). In unpacking this sentence, student must recognize that the instructional content was interrupted by the reference to a figure. Students may need explicit instruction with common occurrences of “interruption constructions” in science texts (Fang, 2006). Such instruction may require reading the sentence without the reference to the figure in the middle and adding the reference instead at the end (Fang, 2006; Malani, Murza, Proly, Davis, & Zadroga, 2010).

Another important language underpinning to address in science is nominalization. As mentioned previously, nominalization is the process of changing more frequently used verbs and adjectives into uncommonly used nouns. The following excerpt from a seventh-grade science text illustrates how a more commonly used word such as *conserve* is changed into the more complex idea of *conservation*.

The law of conservation of energy states that energy can neither be created nor destroyed. This means that even though it appears that energy

is being used up, it is not disappearing. The law of conservation of energy is true in all known cases—energy is never lost, it just changes form. (Complete Curriculum, 2010, p. 5)

SLPs, with their expertise in language, are well equipped to address nominalization with struggling adolescents. Using knowledge of derivational morphology, an SLP might teach students the different forms of nominalizations, such as *conservation*. Students lacking morphological awareness may not understand that knowledge of a root word such as *conserve* can help them figure out the meanings of unfamiliar derivations (e.g., *conservation*, *conserver*, *conservative*). The SLP can make this explicit through the use of a think aloud procedure.

CONCLUSION

The discourse features of specific disciplines provide secondary educators with a different framework to guide language and literacy work, inextricably tied to the acquisition of domain knowledge. The rationale for moving in this direction seems cogent. However, of concern is the status of adolescents who struggle with intermediate or basic literacy as described by Shanahan and Shanahan (2008). More than a few adolescents are likely to need help in these areas.

As professionals with expertise in language, SLPs can play a valuable role in promoting disciplinary literacy competencies in adolescents who struggle while working on more fundamental skills and strategies with which they may have difficulty. It is well within their work scope to do so, as defined by their professional association’s policy documents on roles and responsibilities of SLPs in schools (ASHA, 2010). Included would be intervention with students who struggle and collaboration with secondary teachers to help them work with the language features of domain discourse. It is also advisable for SLPs to keep abreast of research in this nascent area because, as we have noted, a strong evidence base of effective practices does not yet exist.

REFERENCES

- Abrahamsen, E. P., & Shelton, K. C. (1989). Reading comprehension in adolescents with learning disabilities: Semantic and syntactic effects. *Journal of Learning Disabilities, 22*(9), 569–572.
- Alvermann, D. E., & Phelps, S. F. (2005). *Content reading and literacy: Succeeding in today's diverse classrooms* (4th ed.). Boston: Pearson Education Inc.
- American Speech-Language-Hearing Association. (2010). *Roles and responsibilities of speech-language pathologists in schools* [Professional Issues Statement]. Retrieved October 15, 2010, from www.asha.org/policy
- Berninger, V. W., Abbott, R. D., Nagy, W., & Carlisle, J. (2010). Growth in phonological, orthographic, and morphological awareness in grades 1 to 6. *Journal of Psycholinguistic Research, 39*, 141–163. doi: 10.1007/s10936-009-9130-6
- Biancarosa, G., & Snow, C. (2006). *Reading next—A vision for action and research in middle and high school literacy*. Washington, DC: Alliance for Excellent Education.
- Bradley, L., & Bryant, P. (1983). Categorizing sounds and learning to read: A causal connection. *Nature, 301*, 419–421.
- Bullock, J. O. (1994). Literacy in the language of mathematics. *The American Mathematical Monthly, 101*(8), 735–743.
- Carlisle, J. F. (1987). The use of morphological knowledge in spelling derived forms by learning-disabled and normal students. *Annals of Dyslexia, 37*, 90–108.
- Carlisle, J. F. (2004). Morphological processes. In C. A. Stone, E. R. Silliman, B. J. Ehren, & K. Apel (Eds.), *Handbook of language & literacy: Development and disorders* (pp. 318–339). New York: Guilford Press.
- Carrington, L., Collins, M. P., Iriye, A., Martinez, R. J., & Stearns, P. N. (2005). *World history: The human journey*. New York: Holt Rinehart & Winston.
- Catts, H., & Kamhi, A. (Eds.). (1999). *Language and reading disabilities*. Boston: Allyn & Bacon.
- Catts, H., & Kamhi, A. (Eds.). (2005). *Language and reading disabilities* (2nd ed.). Boston: Allyn & Bacon.
- Chapman, C., & King, R. (2003). *Differentiated instructional strategies for reading in the content areas*. Thousand Oaks, CA: Corwin Press.
- Complete Curriculum. (2010). *In flight with eighth grade science: Lesson 14 review of energy*. Retrieved September 20, 2011, from <http://www.completecurriculum.com/>
- Cooter, R. B., & Flynt, E. S. (1996). *Teaching reading in the content areas: Developing content literacy for all students*. Englewood Cliffs, NJ: Prentice Hall.
- Crawley, S. J., & Mountain, L. (1995). *Strategies for guiding content reading* (2nd ed.). Needham Heights, MA: Allyn & Bacon.
- Culatta, B., & Merritt, D. D. (1998). *Language intervention in the classroom*. San Diego, CA: Singular.
- Draper, R. J. (2008). Redefining content-area literacy teacher education: Finding my voice through collaboration. *Harvard Educational Review, 78*(1), 60–83.
- Edmonds, M. S., Vaughn, S., Wexler, J., Reutebuch, C., Cable, A., Tackett, K. K., & Schnakenberg, (2009). A synthesis of reading interventions and effects on reading comprehension outcomes for older struggling readers. *Review of Educational Research, 79*(1), 262–300.
- Ehren, B. J. (1989). Facilitating academic success with language intervention. *Seminars in Speech and Language, 10*(3), 181–259.
- Ehren, B. J. (2006). Partnerships to support reading comprehension for students with language impairment. *Topics in Language Disorders, 26*(1), 42–54.
- Ehren, B. J. (2009). Reading comprehension and expository text structure: Direction for intervention with adolescents. In M. Nippold & Scott C. (Eds.), *Expository discourse in children, adolescents, and adults: Development and disorders* (pp. 217–242). London: Psychology Press.
- Ehren, B. J. (2010, November). *Focusing a language lens on disciplinary literacy: An SLP perspective*. Presented at the American Speech Language and Hearing Association annual convention, Philadelphia, PA.
- Ehren, B. J., & Laster, B. J. (2010, April). *The language of collaboration in RTI*. Presented at the International Reading Association Convention, Chicago, IL.
- Ehren, B. J., Lenz, B. K., & Deshler, D. D. (2004). Enhancing literacy proficiency in adolescents and young adults. In A. Stone, E. Silliman, B. Ehren & K. Apel (Eds.), *Handbook of language and literacy* (pp. 600–625). New York: Guilford Press.
- Ehren, B. J., & Whitmire, K. A. (2009). Speech-language pathologists as primary contributors to RTI at the secondary level. *Seminars in Speech and Language, 30*(2), 90–104.
- Englert, C. S., & Thomas, C. C. (1987). Sensitivity to text structure in reading and writing: A comparison between learning disabled and non-learning disabled students. *Learning Disability Quarterly, 10*, 93–105.
- Fang, Z. (2006). The language demands of science reading in middle school. *International Journal of Science Education, 28*(5), 491–520.
- Fang, Z. (2012). Language correlates of disciplinary literacy. *Topics in Language Disorders, 32*(1), 19–34.
- Fang, Z., & Schleppegrell, M. J. (2010). Disciplinary literacies across content areas: Supporting secondary reading through functional language analysis. *Journal of Adolescent and Adult Literacy, 53*(7), 587–597. doi:10.1598/JAAL.53.7.6
- Fang, Z., Schleppegrell, M., & Cox, B. (2006). Understanding the language demands of schooling: Nouns in academic registers. *Journal of Literacy Research, 38*(3), 247–273.

- Flood, J., & Menyuk, P. (1983). The development of metalinguistic awareness and its relation to reading achievement. *Journal of Applied Developmental Psychology, 4*(1), 65-80. doi: 10.1016/0193-3973(83)90059-X
- Fritschmann, N. S. (2006). *The effects of instruction in an inference strategy on the reading comprehension of adolescents with learning disabilities*. Doctoral dissertation. Retrieved January 16, 2011, from ProQuest Dissertation and Theses.
- Gersten, R., Fuchs, L. S., Williams, J. P., & Baker, S. (2001). Teaching reading comprehension strategies to students with learning disabilities: A review of the research. *Review of Educational Research, 71*(2), 279-320.
- Gillon, G., & Dodd, B. (1995). The effects of training phonological, semantic, and syntactic processing skills in spoken language on reading ability. *Language, Speech, and Hearing Services in Schools, 26*(1), 58-68.
- Goetze, S., Laster, B., & Ehren, B. J. (2010). RTI for secondary school literacy. In M. Y. Lipson & K. K. Wixon (Eds.), *Successful approaches to RTI: Collaborative practices for improving K-12 literacy* (pp. 173-211). Newark, DE: International Reading Association.
- Gray, W. S. (1925). A modern program of reading instruction for the grades and high school. In G. M. Whipple (Ed.), *Report of the National Committee on Reading: 24th yearbook of the National Society for the Study of Education, part 1* (pp. 21-73). Bloomington, IL: Public School Publishing.
- Guthrie, J. T., & Davis, M. H. (2003). Motivating struggling readers in middle school through an engagement model of classroom practice. *Reading & Writing Quarterly, 19*(1), 59-85.
- Hake, S., & Saxon, J. (2004). *Saxon math: 8/7 with pre-algebra*. Norman, OK: Saxon Publishers.
- Halliday, M. A. K. (2004). *The language of science* (Vol. 5 in J. Webster [Ed.], *The Collected Works of M. A. K. Halliday*). New York: Continuum.
- Heller, R., & Greenleaf, C. (2007). *Literacy instruction in the content areas: Getting to the core of middle and high school improvement*. Washington, DC: Alliance for Excellent Education.
- Herber, H. L. (1970). *Teaching reading in the content areas* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.
- Hiebert, E. H. (1980). The relationship of logical reasoning ability, oral language comprehension, and home experiences to preschool children's print awareness. *Journal of Reading Behavior, 12*, 313-324.
- Ivey, G. (1999a). A multicase study in the middle school: Complexities among young adolescent readers. *Reading Research Quarterly, 34*, 172-192.
- Ivey, G. (1999b). Reflections on teaching struggling middle school readers. *Journal of Adolescent and Adult Literacy, 42*(5), 372-381.
- Kamil, M. L., Borman, G. D., Dole, J., Kral, C. C., Salinger, T., & Torgesen, J. (2008). *Improving adolescent literacy: Effective classroom and intervention practices: A practice guide* (NCEE No. 2008-4027). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved February 23, 2009, from <http://ies.ed.gov/ncee/wwc>
- Kroll, B. M. (1981). Developmental relationships between speaking and writing. In B. M. Kroll and R. J. Vann (Eds.), *Exploring speaking-writing relationships: Connections and contrasts* (pp. 32-54). Urbana, IL: National Council of Teachers of English.
- Lee, C., & Spratley, A. (2009). *Reading in the disciplines: The challenges of adolescent literacy*. New York: Carnegie Corporation of New York.
- Leong, C. K. (1989). Productive knowledge of derivational rules in poor readers. *Annals of Dyslexia, 39*, 94-115.
- Malani, M., Murza, K., Proly, J., Davis, K., & Zadroga, C. (2010, April). *Disciplinary literacy: What's language got to do with it?* Paper presented at the University of Central Florida Annual Literacy Symposium, Orlando, FL.
- Malone, L. D., & Mastropieri, M. A. (1992). Reading comprehension instruction: Summarization and self-monitoring training for students with learning disabilities. *Exceptional Children, 58*(3), 270-279.
- McKenna, M. C., & Robinson, R. D. (1990). Content literacy: A definition and implications. *Journal of Reading, 34*, 184-186.
- Miller, L. (1989). Classroom-based language intervention. *Language, Speech, and Hearing Services in Schools, 20*(2), 153-169.
- Moje, E. B., Overby, M., Tysvaer, N., & Morris, K. (2008). The complex world of adolescent literacy: Myths, motivations, and mysteries. *Harvard Educational Review, 78*(1), 107-154.
- Monte-Sano, C. (2010). Disciplinary literacy in history: An exploration of the historical nature of adolescents' writing. *The Journal of the Learning Sciences, 19*, 539-568. doi: 10.1080/10508406.2010.481014
- Moran, C., & Gillon, G. (2005). Inference comprehension of adolescents with traumatic brain injury: A working memory hypothesis. *Brain Injury, 19*, 743-751.
- National Center for Education Statistics. (2009). The Nation's Report Card: Reading 2009 (NCES No. 2010-458). Washington, DC: Institute of Education Sciences, U.S. Department of Education.
- National Center for Education Statistics. (2010). The Nation's Report Card: Grade 12 Reading and Mathematics 2009 National and Pilot State Results (NCES No. 2011-455). Washington, DC: Institute of Education Sciences, U.S. Department of Education.
- Nelson, N. (1989). Curriculum-based language assessment and intervention. *Language, Speech, and Hearing Services in Schools, 20*(2), 170-184.
- Nippold, M. A. (1993). Adolescent language developmental markers in adolescent language: Syntax, semantics,

- and pragmatics. *Language, Speech and Hearing Services in Schools*, 24, 21–28.
- Nippold, M. A., & Fey, S. H. (1983). Metaphoric understanding in preadolescents having a history of language acquisition difficulties. *Language, Speech and Hearing Services in Schools*, 14, 171–180.
- Oakhill, J. (1994). Individual differences in children's text comprehension. In M. A. Gernsbacher (Eds.), *Handbook of psycholinguistics* (pp. 821–848). New York: Academic Press.
- Oakhill, J., Cain, K., & Yuill, N. (1998). Individual differences in children's comprehension skill: Towards and integrated model. In C. Hulme & M. Joshi (Eds.), *Reading and spelling: Development and disorder* (pp. 82–104). Merharh, NJ: Erlbaum.
- 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(3), 442–463.
- Otero, J., Leon, J. A., & Graesser, A. C. (Eds.), (2002). *The psychology of science text comprehension*. Mahwah, NJ: Erlbaum.
- Perfetti, C. A., Britt, M. A., & Georgi, M. C. (1995). *Text-based learning and reasoning: Studies in history*. Hillsdale, NJ: Erlbaum.
- Pressley, M., Borkowski, J. G., & O'Sullivan, J. T. (1985). Children's metamemory and the teaching of memory strategies. In D. I. Forest-Pressley, G. E. MacKinnon, & T. G. Waller (Eds.), *Metacognition, cognition, and human performance*. (pp. 111–153). Orlando, FL: Academic Press.
- Pressley, M., El-Dinary, P.B., Gaskins, I., Schuder, T., Bergman, J., Almasi, L., et al. (1992). Beyond direct explanation: Transactional instruction of reading comprehension strategies. *Elementary School Journal*, 92, 511–554.
- Pressley, M., Levin, J. R., & McDaniel, M. A. (1987). Remembering versus inferring what a word means: Mnemonic and contextual approaches. In M. McGeown & M. E. Curtis (Eds.), *The nature of vocabulary acquisition*. (pp. 107–127). Hillsdale, NJ: Erlbaum.
- Qualls, C. D., Lantz, J. M., Pietrzyk, R. M., Blood, G. W., & Scheffner Hammer, C. (2004). Comprehension of idioms in adolescents with language-based learning disabilities compared to their typically developing peers. *Journal of Communication Disorders*, 37, 295–311. doi:10.1016/j.jcomdis.2003.12.001
- Richardson, J. S., & Morgan, R. F. (1990). *Reading to learn in the content areas*. Belmont, CA: Wadsworth Inc.
- Ruddell, R. B., & Ruddell, M. R. (1994). Language acquisition and literacy processes. In R. B. Ruddell, M. R. Ruddell & H. Singer (Eds.), *Theoretical models and processes of reading* (4th ed., pp. 83–103). Newark, DE: International Reading Association.
- Salahu-Din, D., Persky, H., & Miller, J. (2008). *The Nation's Report Card: Writing 2007* (NCES No. 2008-468). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.
- Scammacca, N., Roberts, G., Vaughn, S., Edmonds, M., Wexler, J., Reutebuch, C. K., et al. (2007). *Interventions for adolescent struggling readers: A meta-analysis with implications for practice*. Portsmouth, NH: Center on Instruction, RMC Research Corporation.
- Scarborough, H. S. (1990). Index of productive syntax. *Applied Psycholinguistics*, 11, 1–22.
- Schumaker, J. B., Deshler, D. D., Nolan, S. M., & Alley, G. R. (1994). *The Self-questioning strategy: Instructor's manual*. Lawrence: The University of Kansas Center for Research on Learning.
- Scott, C. M. (2004). Morphological processes. In C. A. Stone, E. R. Silliman, B. J. Ehren & K. Apel (Eds.), *Handbook of language & literacy: Development and disorders* (pp. 340–362). New York: Guilford Press.
- Shanahan, T. (2010, July). *You don't have to be a Vulcan to know about disciplinary literacy*. Keynote presented at the Strategic Instruction Model Conference, Lawrence, KS.
- Shanahan, T., & Shanahan, C. (2008). Teaching disciplinary literacy to adolescents: Rethinking content-area literacy. *Harvard Educational Review*, 78(1), 40–57.
- Shanahan, T., & Shanahan, C. (2012). What is disciplinary literacy and why does it matter? *Topics in Language Disorders*, 32(1), 7–18.
- Seidenberg, P. L., & Bernstein, D. K. (1986). The comprehension of similes and metaphors by learning-disabled and nonlearning-disabled children. *Language, Speech, and Hearing Services in Schools*, 17, 219–229.
- Snow, C. (2002). *Reading for understanding: Toward and R&D program in reading comprehension*. Santa Monica, CA: RAND Study Group.
- Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academies Press.
- Spargo, E. (Ed.). (1989). *Timed readings in literature: Book six*. Chicago, IL: Jamestown Publishers.
- Todd, R., Bowman, D., & Zapanta, L. (Eds.). (2007). *Holt science and technology: Life science*. Austin, TX: Holt Rinhart & Winston.
- Torgesen, J. K., Houston, D. D., Rissman, L. M., Decker, S. M., Roberts, G., Vaughn, S., et al. (2007). *Academic literacy instruction for adolescents: A guidance document from the Center on Instruction*. Portsmouth, NH: Center on Instruction. Retrieved March 10, 2009, from <http://www.centeroninstruction.org/files/Academic%20Literacy.pdf>
- Vacca, R. T., & Vacca, J. A. (2005). *Content area reading: Literacy and learning across the curriculum* (8th ed.). Boston: Allyn & Bacon.

- Wallach, G., & Butler, K. (1994). *Language learning disabilities in school-age children and adolescents*. New York: Macmillan.
- Wiggins, G., & McTighe, J. (1998). *Understanding by design*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Yore, L. D., & Treagust, D. F. (2006). Current realities and future possibilities: Language and science literacy—Empowering research and informing instruction. *International Journal of Science Education*, 28(2-3), 291-314. doi: 10.1080/09500690500336973
- Yuill, N., & Oakhill, J. (1991). *Children's problems in text comprehension: An experimental investigation*. New York: Cambridge University Press.
- Zygouris-Coe, V. (2012). Disciplinary literacy and Common Core State Standards. *Topics in Language Disorders*, 32(1), 35-50.