Words as Tools: Learning Academic Vocabulary as Language Acquisition

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ABSTRACT

There is a growing awareness of the importance of academic vocabulary, and more generally, of academic language proficiency, for students' success in school. There is also a growing body of research on the nature of the demands that academic language places on readers and writers, and on interventions to help students meet these demands. In this review, we discuss the role of academic vocabulary within academic language, examine recent research on instruction in academic vocabulary, considering both general academic words and discipline-specific words, and offer our perspective on the current state of this research and recommendations on how to continue inquiry and to improve practice in this area. We use the metaphor of 'words as tools' to reflect our understanding that instruction in academic vocabulary must approach words as means for communicating and thinking about disciplinary content, and must therefore provide students with opportunities to use the instructed words for these purposes as they are learning them.

There is a growing body of work showing the importance of academic language proficiency for accessing the content of academic texts and academic talk (Bailey & Heritage, 2008; Guerrero, 2004; Schleppegrell, 2004b); learning to think and learn like a scientist, historian, mathematician, or writer (Honig, 2010; Schleppegrell, 2007; Shanahan & Shanahan, 2008); and overall academic achievement (Hakuta, Butler, & Witt, 2000; Short & Fitzsimmons, 2007; Townsend, Filippini, Collins, & Biancarosa, in press). The importance of academic language (also referred to as academic English or the language of schooling; cf. Snow & Uccelli, 2009) is also being tied to teacher evaluation. In a number of states, for example, teacher candidates' lesson plans have begun to be evaluated in part on the extent to which these plans identify the language demands of the texts and instruction and offer specific means for helping all students cope with these

demands (American Association of Colleges for Teacher Education, 2011).

This review addresses a specific aspect of academic language, namely, instruction in academic vocabulary. Academic vocabulary is perhaps the most obvious aspect of academic language, and lack of academic vocabulary knowledge has consistently been identified as an obstacle to student success (Corson, 1997; García, 1991; Snow & Kim, 2007). We consider both general academic words (i.e., words used across disciplines and with greater frequency in academic than nonacademic language) and discipline-specific academic words.

Although our focus is on instruction in academic vocabulary, we do not believe that academic vocabulary can be learned apart from the acquisition of the academic language of which it is an essential, but not the only, part. Hence, our review is motivated by the

question What does it mean to teach academic vocabulary in a way that acknowledges academic vocabulary as inseparable from academic language?

In reviewing the research on academic vocabulary instruction, one of our main goals is to bring some clarity to this complex and rapidly growing literature. For the sake of clarity, we must also acknowledge at the outset that our review is shaped by our perceptions of the instructional context: K–12 vocabulary instruction in the United States seldom achieves the quality and intensity necessary to bring students not already familiar with academic language to the point of ownership of the instructed words (Beck, McKeown, & Kucan, 2002; Gersten, Dimino, Jayanthi, Kim, & Santoro, 2010; McKeown, Beck, Omanson, & Pople, 1985; Scott, Jamieson-Noel, & Asselin, 2003; Stahl & Fairbanks, 1986).

The recent wave of work on academic vocabulary instruction has drawn on many different fields and ideas, and the purpose of this review is to synthesize the recent literature and provide a cohesive set of recommendations on how to continue inquiry and improve practice in this area. As one means to this end, we are adopting "words as tools" as an organizing metaphor for this review, hoping that it can bring some coherence to a complex topic. The main implications of this metaphor are that instruction in academic vocabulary must include attention to the purpose for which academic words are used (recognizing that the communicative purposes of academic language are often very different from those of typical conversation) and that students must have opportunities to use the instructed words for these purposes.

We begin by laying out our theoretical framework: first, an overview and definition of academic language, and then a description of the role of academic vocabulary in academic language. After that, we review the empirical research on academic vocabulary instruction—both general academic vocabulary and domain-specific vocabulary. In the final section, we consider what still needs to be known in order to teach academic vocabulary effectively.

What Is Academic Language?

Defining Academic Language

Given the importance of academic language, both theoretically within this article and practically in regard to student achievement, we offer a discussion and a definition of *academic language*. Scholarship on academic language has yielded varying definitions; two recent syntheses of academic language and academic vocabulary (Baumann & Graves, 2010; Snow & Uccelli, 2009) highlighted the many expla-

nations that have emerged. In addition, Snow (2010) noted,

> There is no exact boundary when defining academic language; it falls toward one end of a continuum (defined by formality of tone, complexity of content, and degree of impersonality of stance), with informal, casual, conversational language at the other extreme. (p. 450)

Here, we suggest a unified, all-purpose explanation of academic language that is informed by the varying perspectives on the topic: Academic language is the specialized language, both oral and written, of academic settings that facilitates communication and thinking about disciplinary content.

We think a concise definition such as this will be helpful for teachers, but we also acknowledge that it needs some unpacking. This definition can be elaborated on as follows. Academic language is specialized because it needs to be able to convey abstract, technical, and nuanced ideas and phenomena that are not typically examined in settings that are characterized by social and/or casual conversation.

To further unpack this definition, we believe it is important to mention that academic language can be both oral and written. A detailed examination of the differences between oral and written academic language is beyond the scope of this review. For our purposes here, we acknowledge that there are both similarities and differences between oral and written academic language, that both are important, and that instruction should capitalize on the fact that, despite the differences, the two are mutually supportive. Much of what we have to say about academic language may be more true of written than oral academic language because written academic language is likely to contain the properties typical of academic language in a more concentrated form.

Next, academic settings must be explained. By *academic settings*, we mean educational institutions, print publications, and digital media. In short, any context in which disciplinary concepts are being conveyed, in the traditions in which they were developed or discovered, uses academic language.

Finally, the notion that academic language facilitates academic thinking is a relatively novel component of a definition of *academic language*. Academic thinking involves the cognitive processing of disciplinary concepts and phenomena, which would be near impossible without academic language. In contrast, social settings involve language that conveys meaning about community, relationships, and habits/activities. Bailey (2007) has explained how these social topics are no less complex than academic topics. In line with this assertion, we argue that the social topics address either more universal themes (e.g., emotions, social experiences) or

more contextualized situations (e.g., asking a spouse, "Remember that time we had Ethiopian food?"). Social/casual communication requires its own set of linguistic tools to successfully convey ideas, which is reinforced by the fact that individuals can have specific difficulties or deficits in these tools. For example, people with disorders on the autistic spectrum might have little difficulty with academic language but, by the definition of their disorder, might experience significant communication difficulties with social language. However, because academic language conveys the abstract, technical, and nuanced ideas and phenomena of the disciplines, it can help one think in the requisite abstract, technical, and nuanced ways. Academic language, therefore, is a tool that promotes a kind of thinking different from that employed in social settings. Learning academic language is not learning new words to do the same thing that one could have done with other words; it is learning to do new things with language and acquiring new tools for these new purposes.

This explanation of academic language has important implications for supporting students. In essence, teachers have been strongly encouraged to teach academic vocabulary, but in our view, they have not been equipped with the background knowledge on how that vocabulary garners its meaning from the language system, or register, of which it is a part. Change in practice is being promoted, but the change is largely about the types of words teachers teach and not about effectively teaching words within the discourse of the disciplines. Teachers need support in moving from teaching academic vocabulary to teaching the language of their content areas. Often, students do not get support with the connected text that houses academic vocabulary, despite the fact that the vocabulary is most meaningful when it is used within the language of the discipline. A shadow of meaning can be acquired with academic vocabulary, but the tools for academic thinking are best realized when academic language knowledge, both receptive and productive, is developed. Following is an overview of key features of academic language that both use and contribute to word meanings in an academic text or context.

Characteristics of Academic Language

Academic language, especially written academic language (Biber, 2006), differs from everyday conversational English in a number of ways. In particular, academic language has more of the following:

1. Latin and Greek vocabulary
2. Morphologically complex words
3. Nouns, adjectives, and prepositions
4. Grammatical metaphor, including nominalizations
5. Informational density
6. Abstractness

We will explain and illustrate all of these briefly. However, the main point here is that these are not six unrelated facts about academic language; rather, they are all interdependent. The grammatical attributes of academic language—more affixed words, nouns, adjectives, prepositions, and nominalizations—are means of achieving greater informational density and abstractness, and these are typically done with Latin and Greek, rather than Germanic, vocabulary.

Latin and Greek Vocabulary

William the Conqueror's victory at the Battle of Hastings in 1066 initiated a period of about three centuries when Norman French was the literary and administrative language in England. The English-speaking poor might occasionally be able to poach a *deer*, but the French-speaking nobility feasted on *venison*. The poor might tend the *pigs*, but the nobility ate *pork*. Although English eventually replaced French and Latin as the language of the educated classes, a substantial degree of linguistic stratification—everyday words of Germanic origin and academic words from Latin and French—persists to this day. In many cases, one can find pairs of words reflecting the two distinct sources of English vocabulary, the first Germanic and the second from Latin (sometimes via French): *eat/dine*, *be/exist*, *right/correct*, *tooth/dental*, *hand/manual*. However, for many academic words, there is no obvious Germanic equivalent (e.g., *abstract*, *accommodate*, *analogy*, *analyze*, *arbitrary*, *aspect*, *automate*; Coxhead, 2000).

Words of Latin origin are still more common in written and formal registers. For example, Bar-Ilan and Berman (2007) found a greater proportion of Latinate versus Germanic vocabulary in students' and adults' written language than in their spoken language, and more in exposition than in narrative. However, these differences were not found for 9-year-olds and had only begun to emerge for 12-year-olds.

Morphologically Complex Words

Academic language tends to contain longer words, and for the most part, the length is due to prefixes and suffixes (Nagy & Anderson, 1984; Nippold, 2007). Often, there are multiple layers of affixation, as in *organizational* or *predisposition*. Derivational suffixes, typical of academic language, are used to convert one part of speech into another (e.g., *act > active*, *active > activate*, *activate > activation*). Although some derivational suffixes (e.g., the agentive *-er* in *swimmer*) are used productively even by preschoolers (Berko, 1958), the derivational suffixes typical of academic English

are acquired relatively late (Nippold & Sun, 2008; Tyler & Nagy, 1990).

Nouns, Adjectives, and Prepositions

Written academic language has a different distribution of part-of-speech categories than spoken language, even spoken academic language. The greatest difference is in the proportion of nouns; however, written academic language also contains more adjectives and prepositions (Biber, 2006; Fang, 2006; Schleppegrell, 2001).

Grammatical Metaphor

Of all the features we describe, we argue that grammatical metaphor is the largest diversion from social/conversational language and presents the most significant issue for students. In fact, the term *grammatical metaphor* may serve as a comprehension stumbling block for many readers of this article, so let's start there.

The first part of the phrase, *grammatical*, refers to grammar, specifically parts of speech. The second part, *metaphor*, is analogous to lexical metaphor, in which words are applied in contexts that do not apply to their prototypical meaning (Halliday, 1993). For example, the phrase *boils down to* is often used in situations in which there is no actual liquid that is boiling. Rather, the words *boils down to* appropriate a different, metaphorical meaning. Similarly, in a grammatical metaphor, a part of speech is used with a meaning not prototypical of that part of speech. Typically, nouns represent persons, places, or things; verbs represent actions; and identifiable agents (e.g., people) perform actions. However, in grammatical metaphor, nouns can represent complex processes, and abstract concepts can "perform" actions; for example, "The Lexical Quality Hypothesis claims…" (Perfetti, 2007, p. 357), and "This use of language requires students to shift…" (Bailey, 2007, p. 11).

In these examples, a hypothesis is claiming something, and "the use of language" is requiring something; this linguistic construction serves a specific purpose in expressing abstract ideas. As Schleppegrell (2004b) explained, "Grammatical metaphor, then, serves to recast everyday language in more specialized ways that realize the technicality and reasoning that characterize academic registers and enable the construction of theories and explanations" (p. 73). In other words, grammatical metaphor allows for concisely expressing technical, abstract, and/or nuanced disciplinary ideas. However, for those inexperienced with grammatical metaphor, the language in question seems distinctly foreign. Halliday (1993) explained the importance and the prevalence of grammatical metaphor, specifically demonstrating that "specialized technical discourse cannot be created without deploying grammatical metaphor" (p. 111).

Perhaps the most prototypical feature of grammatical metaphor is the use of nominalizations (Fang, 2006; Halliday, 1998; Schleppegrell, 2001, 2007). At the level of the individual word, nominalization is the process of turning some other part of speech (a verb or adjective) into a noun, typically, but not always, by adding a suffix (e.g., *enjoy > enjoyment*, *kind > kindness*, *frustrate > frustration*, *active > activity*, *destroy > destruction*, *report > report*). However, as we discuss in more detail shortly, nominalization is not only a word-level phenomenon but also a syntactic phenomenon. Verbs and adjectives are turned into nouns so they can serve as the head of a noun phrase that expresses a proposition, that is, information that would typically be expressed by a complete sentence (e.g., *They evaluated the program > Their evaluation of the program; The package was heavy > The heaviness of the package*). Nominalization is also one of the more difficult aspects of academic language and is acquired later. In a study of students' understanding of morphological complex words, Nippold and Sun (2008) found that derived nominals were harder for students at ages 10 and 13 than derived adjectives. Students do not begin using nominalizations in their own writing until relatively late. "Nominalizations are a mark of high-level, formal prose style and a very late morphosyntactic development….[T]he proportion of complex noun phrases increases markedly as a function of age, particularly from high school up" (Berman, 2007, p. 353).

Informational Density

Academic language is dense. The word *dense* can be (legitimately) understood as figurative, meaning hard to understand. However, academic language is also dense in a more literal sense, that is, in terms of measures of amount of information per unit of text. For example, lexical density, conventionally measured as the ratio of content words over total words (Eggins, 2004), is greater in academic language (Halliday, 1987; Schleppegrell, 2001).

Abstractness

Academic language is also typically more abstract than everyday conversation. A math text, for example, might contain abstract nouns such as *length*, *width*, *circumference*, *addition*, and *subtraction*. A biology text might contain abstract nouns for processes, such as *respiration* or *mitosis*.

Putting These Together

What we want to stress here is that these six facts about academic language are not six separate facts; they are all functionally related. Academic language

achieves informational density by packing more propositions, and more content words, into a clause, which is typically achieved through the process of nominalization. Nominalization requires not only adding suffixes to adjectives or verbs to form nouns but also increased use of prepositional phrases and attributive nouns and adjectives. Consider the two following sentences:

1. Just because people who read more can read better doesn't mean that if you read more this will make you read better.
2. The correlation between amount of reading and reading ability does not imply a causal relationship.

In oral language, complexity of ideas is more often expressed through subordination, with individual clauses being relatively short. This is because the clause is a natural unit of language processing, and working memory capacity places limits on length (Just & Carpenter, 1992). The first sentence, more typical of oral language, has 22 words and 5 clauses—4.4 words per clause, counting "this will make you read better" as a single clause. The second sentence, more typical of written academic language, has 15 words but consists of only one clause; that is, there is only one finite verb, *imply*, and hence 15 words per clause.

The first sentence has eight content words and thus a lexical density index (i.e., the ratio of content words to total running words) of .36. The second sentence also has eight content words but a lexical density of .53.

Note that the first sentence contains only one noun (*people*), and that a pronoun (e.g., *those*) would have worked just as well there. The second sentence has six nouns, if you count the two instances of the gerund *reading* as nouns. The first sentence has no prepositions or adjectives; the second sentence has two prepositions, one adjective, and one noun functioning as an adjective (the gerund *reading* in the phrase *reading ability*).

The point we want to emphasize here is how the structural differences in the two sentences are related to the differences in density and abstractness. In the second sentence, all of the nouns besides *amount*, which is already an abstract noun, are derived from verbs or adjectives via suffixation: *correlation < correlate*, *reading < read*, *ability < able*, and *relationship < relate*. The adjective *causal*, derived from the noun *cause*, takes a meaning that would normally be expressed by a clause and puts it within a noun phrase. The use of prepositions is necessary for packing all the information in "the correlation between amount of reading and reading ability" into a single noun phrase.

Note also that some of the meanings expressed using Germanic vocabulary in the first sentence are expressed with Latinate vocabulary in the second: *more > amount*, *can > ability*, *make > causal*, and *mean > imply*. One might point out that in the last of these pairs, *mean > imply*, it is simply a matter of substituting a Latinate word for a more familiar Germanic word. However, in the first three cases, the change from Latinate to Germanic is a necessary consequence of the change in part of speech: There is no Germanic noun with the meaning of *can*, there is no Germanic noun with the meaning of *more*, and there is no Germanic adjective with the meaning of *make* in the sense of *cause*.

In fact, the Germanic part of English has somewhat restricted resources for creating nouns. There are Germanic suffixes that create abstract nouns from adjectives (e.g., *strength*, *kindness*) and nouns from other nouns (e.g., *kingdom*, *brotherhood*, *friendship*), and one suffix that creates concrete nouns from verbs (e.g., *singer*). There are a few Germanic suffixes that create abstract nouns from verbs (e.g., *grow > growth*, *hate > hatred*). However, the only truly productive of these is the *-ing* ending of gerunds that turns Germanic verbs into abstract nouns (e.g., *his breathing became labored*). Contrarily, with words of Latinate origins, there are several different ways to turn verbs into abstract nouns (e.g., *survive > survival*, *refine > refinement*, *express > expression*, *deprave > depravity*, *perform > performance*, *serve > service*, *expose > exposure*).

To summarize, the abstractness and density of academic language are made possible by syntactic patterns, primarily nominalizations, that require changing parts of speech. Changing parts of speech is typically accomplished by derivational suffixes and, most important, those that create abstract nouns. Latinate vocabulary has more resources for this process than Germanic vocabulary.

Nominalization and the informational density it affords serve the communicative functions of academic language, which are often different from those of typical conversation. Nominalization permits the expression of abstract and complex concepts and of the relationship among them. Hence, Fang and Schleppegrell (2008) claimed,

> Nominalization…allows scientists to create technical taxonomies, to synthesize and systematize detailed information, to build theories, to embed ideology and value, and to develop a cohesive chain of reasoning. Therefore, while nominalization makes science texts more abstract and difficult to read, it is also necessary for constructing the kind of knowledge that science represents. (pp. 26–27)

Academic Vocabulary *Qua* Vocabulary

In the preceding section, we described key characteristics of academic language and tried to show how

they are interrelated and work together to serve the communicative functions of academic language. We now turn to the topic of academic vocabulary per se. Attention to academic vocabulary may be an important first step in raising teachers' awareness of the need to better support students' understanding and use of the language of the disciplines. Additionally, for teachers without a linguistic background, academic vocabulary is the most logical starting point for raising their sensitivity to the linguistic demands of the disciplines.

Not Just Individual Words

However, the first point we want to emphasize is that the characteristics of academic language and its communicative functions must be kept in mind when designing instruction for specific items of academic vocabulary. We chose the metaphor "words as tools" as a theme for this review because being able to use an item of academic vocabulary means being able to use it in service of the functions of academic language.

This metaphor carries with it the implication that individual words are parts of larger systems. First of all, word meanings are parts of conceptual networks. The ability to use a tool includes understanding the relationships among related tools. For example, part of knowing how to use a Phillips screwdriver is knowing how it differs from a flathead screwdriver and knowing which kind of screw to use it with. Likewise, academic thinking requires dealing with systems of concepts, not just with individual concepts in isolation.

A word's meaning consists not only of what it refers to but also of its relationship to other words that might be used for that concept or related concepts. The use of the word *above* in English, for example, depends on the implicit contrasts between the meaning of *on*, a contrast that is not found in some other languages (Bowerman & Choi, 2003; Munnich & Landau, 2003). Different languages divide up the conceptual universe in quite different ways, so the equivalent word in another language cannot really be said to mean the same thing because it is part of a system with a very different structure (Lucy, 2010).

Words also belong to morphological families. Part of the utility of a socket wrench set is that interchangeable sockets allow one to use a single handle for nuts of a variety of sizes. Likewise, suffixes can be added to or removed from a word to make it fit into different contexts; for example, the verb *observe* can be changed to an abstract noun (*observation*), an agentive noun (*observer*), or an adjective (*observant*) to serve different functions in a sentence. Yet, the ability to add nominalizing suffixes to adjectives and verbs is incomplete without the knowledge of how the resulting nominalizations are used.

Words also occur in formulaic sequences (Mel'čuk, 1995; Nattinger & DeCarrico, 1992; Schmitt, 2004). A project can be *under consideration* or *in process*, and a person can be *beneath contempt*, *beyond hope*, or *above reproach*, but if the prepositions in these phrases are switched, one is no longer dealing with idiomatic English. Thus, part of knowing how to use a word is knowing what other words it is typically used with. One of the major findings of corpus-based studies has been the extent to which language uses prefabricated phrases, or formulaic sequences (Biber, Johansson, Leech, Conrad, & Finegan, 1999).

Which Words Are Academic?

Academic vocabulary words are typically broken down into two categories: general and discipline-specific (Hiebert & Lubliner, 2008). General academic words are used in academic language with greater frequency than in nonacademic language, but they are used across disciplines. General academic words are often abstract words, and their dictionary entries tend to include many definitions. Research on vocabulary instruction in general has shown that students need multiple opportunities to read and use words in multiple contexts (Blachowicz & Fisher, 2000; McKeown et al., 1985; Stahl & Fairbanks, 1986), which is particularly important with general academic words. Students in K–12 settings with limited academic language proficiency will not come to understand words like *structure* or *function* by memorizing definitions. Rather, it is repeated exposures to these words and opportunities to practice using them in authentic contexts that allow students to own these words and use them with facility in the contexts in which they both garner and support meaning of technical or theoretical ideas.

Coxhead's (2000) work on general academic words is one of the seminal pieces of scholarship in this area; she developed the Academic Word List, a list of the 570 most common general academic word families in college-level texts across four disciplines. Coxhead's work has been met with much enthusiasm and some criticism. Researchers and educators alike have found the Academic Word List to be extremely helpful in identifying actual words and types of words that may help students access academic texts. Intervention research using the Academic Word List, subsets of this list, or words similar to those on the list as target words have yielded significant gains in students' word knowledge (Lesaux, Kieffer, Faller, & Kelley, 2010; Snow, Lawrence, & White, 2009; Townsend & Collins, 2009).

However, the Academic Word List and its applications have invited criticism, particularly when it has been appropriated as a prescriptive list of words that should be taught in order to remedy students' compre-

hension difficulties with academic texts (Hancioğlu, Neufeld, & Eldridge, 2008). Other criticisms related to the nature of the words on the list; in particular, just because words are used across disciplines does not mean that they have the same meanings across disciplines (Hyland & Tse, 2007). In other words, the words may be cross-discipline, but there may be discipline-specific meanings for the same words in different disciplines. Consider the words *force* and *function*; these words have technical, discipline-specific meanings in physics and in math but are used liberally across academic disciplines in a variety of contexts. The polysemous nature of many general academic words is further testament to the importance of building academic word knowledge within authentic contexts, not in isolation.

The claims of the proportion of text covered by the Academic Word List are based not only on the 570 headwords in the list but also on their morphological relatives. For example, the word *abstract* is listed, but the words *abstraction*, *abstractions*, *abstractly*, and *abstracts* are included when counting the proportion of text covered by the Academic Word List. This generalization is reasonable insofar as students who know the headword are able to infer the meanings of the other members of the morphological family. However, morphological awareness is very strongly correlated with vocabulary size (Wagner, Muse, & Tannenbaum, 2007), so students most in need of vocabulary instruction are least likely to be able to make such inferences on their own. Furthermore, family members are not always related in meaning to the headword transparently. For example, the headword *constitute* covers *constituencies*, *constituency*, *constituent*, *constituents*, *constituted*, *constitutes*, *constituting*, *constitution*, *constitutions*, *constitutional*, *constitutionally*, *constitutive*, and *unconstitutional*. In this case, we consider it unlikely that instruction on the headword would lead to measurable gains in knowledge of the meanings of some of these morphological relatives.

One final criticism of the Academic Word List, if used as a comprehensive list of words to be taught, is rooted in its design. The Academic Word List does not include words on the General Service List (West, 1953), which is typically construed as the 2,000 most common words in English. However, there are many words on the General Service List that fit the description of general academic words and are, therefore, challenging to learn and deserving of instructional attention. We view the Academic Word List as a very important contribution, both in design and instructional application, but it is best used as a list of one type of word that teachers should attend to as opposed to a list of the most important academic words. Understanding what types of academic words are important for students to learn can help teachers select appropriate target words for instruction from the texts being studied.

Despite these criticisms of the Academic Word List, Townsend et al. (in press) showed that knowledge of general academic words contributes unique variance to achievement across disciplines. In a sample ($n = 339$) of diverse middle school students, knowledge of general academic words explained significant and unique variance in achievement in math, social studies, science, and English language arts (R^2 ranged between .19 and .34). Even when overall breadth of vocabulary was controlled for to address the possibility that knowledge of general academic words would be subsumed in the construct of overall breadth of vocabulary knowledge, the variance explained in this very conservative set of analyses was still significant (R^2 ranged between .02 and .07).

The second category of academic words, discipline-specific, includes words that are typically unique to individual academic disciplines. Words such as *polynomial*, *cytoplasm*, and *federalism* are typically used in just one discipline (math, science, and history, respectively) with typically just one meaning. Discipline-specific words can be technical or abstract, and understanding them is essential to building conceptual knowledge in the disciplines in which they are used. However, as already mentioned, developing knowledge of these words should occur while developing knowledge of the overall register of the discipline. Building knowledge of discipline-specific words does not guarantee access to disciplinary texts. Rather, studying disciplinary texts with appropriate scaffolding will help students understand discipline-specific words.

Review of Selected Academic Vocabulary Interventions

With this framework of academic vocabulary as a part of the academic language proficiency that students need, we now review selected interventions that, to varying degrees, work within this framework and support students' general and discipline-specific academic vocabulary development. In recent years, a number of intervention studies have been published that present findings on the efficacy of approaches to supporting students' academic vocabulary development. This work rests on the body of scholarship on vocabulary instruction, which established important principles of instruction with respect to building word knowledge. For example, Graves (2000) identified four components of a vocabulary curriculum: wide reading, promoting word consciousness, teaching word learning strategies, and teaching individual words. Stahl and Fairbanks

(1986), in their seminal meta-analysis of the effects of vocabulary instruction on comprehension, highlighted three principles of effective vocabulary instruction: teaching both definitional and contextual information, promoting depth of processing, and providing multiple encounters of words.

Beck et al. (2002), Blachowicz and Fisher (2000), Graves (2006), Stahl and Nagy (2006), and others have brought much of the research findings on vocabulary instruction to practice with their practitioner texts. From this large body of work on vocabulary learning and instruction, there is a common theme that is particularly important for academic language. Vocabulary learning must occur in authentic contexts, with students having many opportunities to learn how target words interact with, garner meaning from, and support meanings of other words. Indeed, contemporary texts for teachers encourage the practice of identifying meaningful words for instruction within academic materials and then teaching those words within the contexts in which they are used (Beck et al., 2002; Fang & Schleppegrell, 2008; Zwiers, 2008).

As a foundation to the intervention research on content-specific academic language, there is a body of literature that has explicated the academic demands of the various content areas. For example, Schleppegrell (2007) identified the unique linguistic features of the math register, Honig (2010) explored the scientific language demands present in primary grades, and Zwiers (2007) investigated the type of academic language instruction that can support historical thinking with middle school students. Chung and Nation's (2003) work on technical vocabulary provided guidelines for identifying technical words in the disciplines that may be targets for instruction. This work has been extremely important for the burgeoning body of intervention research; indeed, effective interventions could hardly be designed without a clear set of language goals to meet within those interventions.

In addition to these bodies of literature, which focused primarily on instruction in English at the K–12 level, mostly in the United States, there is the work on vocabulary learning and assessment in the context of second- or foreign-language instruction and higher education by scholars such as Nation (Chung & Nation, 2003; Nation, 2001; Nation & Newton, 1996), Laufer (1998, 2001, 2003; Laufer & Nation, 1995); Meara (2002, 2006; Meara & Alcoy, 2010), and Schmitt (Ishii & Schmitt, 2009; Pellicer-Sánchez & Schmitt, 2010; Schmitt, Schmitt, & Clapham, 2001). Although this valuable work has provided foundational insights into vocabulary acquisition and instruction, and has certainly informed our thinking, the contexts of second- and foreign-language instruction are beyond the scope of this review to a large extent.

The principles for vocabulary instruction that have emerged from these bodies of literature are important and have the potential to substantially improve students' learning of new words. These principles also inform much of the work on academic vocabulary instruction at the K–12 level, which can generally be divided into two groups. In the first group, studies focus on general, or cross-discipline, academic words. The second group is comprised of studies focusing on discipline-specific academic words, such as science or math vocabulary. The intervention studies we review here are not meant to be representative of the entire body of vocabulary intervention research or academic language research. Rather, they are the most recent, robust, and relevant intervention studies that have targeted the context for which we have focused our discussion, K–12 classrooms with diverse populations of students. In addition, all of the studies showcased in the following review situated academic vocabulary in larger academic language contexts, such as expository texts, oral language activities (e.g., classroom debates), and writing tasks. In other words, each of the studies, albeit to differing degrees, helped students build knowledge of academic words as well as the linguistic and academic contexts in which they function.

Finally, because the language of textbooks and classrooms becomes increasingly complex and academic from about fourth grade on (Biemiller, 1999; Fang, Schleppegrell, & Cox, 2006), academic language interventions are usually situated in secondary classrooms. Thus, these studies all took into account the dynamic classroom environment created by adolescents from various linguistic and socioeconomic backgrounds and with varying degrees of motivation and engagement.

Intervention Research on General Academic Words

In the first category, that of studies on general (i.e., cross-discipline) academic vocabulary instruction, three examples are presented, with sample sizes ranging from smallest to largest. Additionally, although all three interventions teach academic vocabulary as academic language, they range from less comprehensive to more comprehensive with respect to the degree that the interventions encompassed multiple contexts for word learning and multiple opportunities for language use.

In the first study, Townsend and Collins (2009) designed and facilitated an intervention, language workshop, to build middle school language-minority students' academic vocabulary knowledge in an after-school setting. The target words were the first 60 words from Coxhead's (2000) Academic Word List, which are the most frequent words from the list in academic

texts. Students ($n = 37$) had multiple exposures to the words in relation to specific content from social studies and science and had many opportunities to practice and personalize word meanings. A modified format of the Vocabulary Knowledge Scale (Paribakht & Wesche, 1997) was used to measure students' gains in the target words, which involved items that asked students whether they had heard or seen the words, whether they could explain the meanings of the words, and whether they could explain contexts in which the words would be used. This item format approximated depth of knowledge, allowing the researchers to evaluate students' incremental knowledge gains with the target words. In this experimental study, Townsend and Collins found that the intervention was effective in building students' depth of knowledge of the target words (a medium effect size as measured with partial eta-squared = .15) and that gains were maintained in delayed posttesting.

In a much larger quasi-experimental study ($n = 476$ sixth graders), Lesaux et al. (2010) measured the effects of their intervention, Academic Language Instruction for All Students (ALIAS), on students' vocabulary knowledge and reading comprehension. The ALIAS intervention is comprised of 8 two-week instructional units, facilitated by classroom teachers, in which students have multiple exposures and opportunities to practice with eight or nine general academic words from the Academic Word List (Coxhead, 2000). Lesaux and her colleagues found that students made significant gains in vocabulary knowledge in three out of five vocabulary assessments. The three assessments on which students made significant gains were an experimenter-designed multiple-choice test on the target words ($d = 0.39$), a morphological decomposition test based on Carlisle's (2000) work ($d = 0.22$), and an experimenter-designed test that measured students' knowledge of the target-word meanings in context ($d = 0.20$). Results on the other two measures, an experimenter-designed measure for depth of knowledge of target words and a standardized reading vocabulary test, were not significant. The intervention also yielded marginally significant gains ($d = 0.15$, $p = .06$) on a standardized measure of reading comprehension. In addition, the researchers found equally beneficial effects for language-minority and monolingual English-speaking students.

The third example of research on general academic word knowledge is the Word Generation program (Snow et al., 2009). As with Language Workshop and ALIAS, Word Generation was designed using established principles of vocabulary instruction. Word Generation is a 24-week program that addresses a sequence of high-interest topics and five new general academic words per week. Teachers in math, social studies, science, and English language arts all facilitate activities with the topics and the target words. Current research on the efficacy of Word Generation has been promising, with findings based on a treatment sample of 697 middle school students and a control group ($n = 319$) showing that "participation in 20 to 22 weeks of the curriculum was equivalent to 2 years of incidental learning" (Snow et al., 2009, p. 334). Among participating schools, effect sizes ranged from 0.33 to 0.56. Gains in academic vocabulary knowledge also predicted achievement on state standardized achievement tests.

Although five words per week may seem small in comparison to the number of words students learn incidentally in a school year (Anglin, 1993; Clark, 1993; Nagy & Herman, 1987), the curriculum provided students with instruction in and opportunity to practice using the words in authentic speaking and writing contexts. The specific academic words are the starting point for each week's set of activities, but the activities designed to build specific word knowledge also build other academic language skills that then inform achievement in other settings. Thus, Word Generation is a good example of the type of instruction that begins with vocabulary but builds a larger set of language skills.

All three of these interventions operated, to varying degrees, from the premise that academic vocabulary words function as part of a larger syntactic and structural network. Language Workshop (Townsend & Collins, 2009) used a number of independent word-learning strategies as well as the study of academic texts in which the words were found. ALIAS (Lesaux et al., 2010) began each unit of word study with authentic, expository texts that used the word, then moved on to a number of opportunities for students to practice with word meanings. Word Generation (Snow et al., 2009) is organized so students receive multiple exposures to the target words across content areas and employs reading, writing, and speaking practice opportunities. In other words, all three interventions had general academic vocabulary knowledge as their target for instruction, but all three (to increasingly greater degrees) situated the words in authentic academic contexts. Thus, this small body of research represents an important foundation that future research should emulate. At the same time, there are a number of limitations with the current state of intervention research, and these are discussed in the final section of this article.

Intervention Research on Discipline-Specific Academic Words

Much of the intervention work on academic language in the content areas has had a broader focus than building knowledge of vocabulary words. Rather, the purpose of these interventions has been, generally, to

build overall science literacy, math literacy, or social studies literacy. As Shanahan and Shanahan (2008) have explained, different language resources and approaches are used in, or dictated by, different disciplines. Therefore, language interventions in the science domain are often designed to help students think like a scientist, those in the social studies domain are often designed to help students think like a historian, and so forth. The degree to which these goals are met are difficult to ascertain because outcome measures are often multiple-choice vocabulary and comprehension tests, which do not necessarily approximate scientific problem solving or historical analysis. Regardless, the goals of the interventions have directed the nature of the instruction used, and typically, students improve on measures of vocabulary and comprehension that are directly tied to the instruction.

An exhaustive review of this literature would have been beyond the scope of our focus on academic vocabulary instruction, particularly because the bodies of scholarship on language in the disciplines are expansive and use unique terminology. However, a new body of scholarship on discipline-specific academic language interventions is emerging, and this work is informed by the assertions we set forth in previous sections. Namely, academic vocabulary instruction in the content areas must occur as part of a set of instructional goals that support students' facility with math language, science language, and so on. We now review a representative sample of studies from this line of inquiry that situates discipline-specific academic vocabulary words within their larger discipline registers.

In an intervention designed to support middle school students' vocabulary and comprehension in social studies, Vaughn and her colleagues (2009) designed a treatment, including explicit vocabulary instruction, videos and purposeful discussion, graphic organizers, and paired grouping (i.e., students collaborating in pairs in instructional activities), in a series of two experiments with multiple classrooms in the treatment and control groups. Outcome measures were experimenter-designed measures of vocabulary and comprehension that were directly tied to the content being taught. Treatment students outperformed control students on both measures, even among English learners, and even the most conservatively calculated effect sizes for both vocabulary and comprehension were moderate to large (respectively, 0.49 and 0.81 for study 1 and 0.36 and 0.47 for study 2, a replication of study 1).

However, the researchers noted that although significant, the actual comprehension gains were relatively small, with the correct number of responses improving from less than one at pretest to only three or four (out of 10 questions designed to measure students' knowledge of the big ideas of social studies) at posttest. In addition, the researchers noted that their vocabulary measure was a receptive matching task without any productive element and, therefore, did not demonstrate the depth to which students may have learned the words, nor did student gains generalize to a separate measure of general breadth of vocabulary knowledge. The researchers also suggested that their intervention could be generalized to other content areas, which is quite useful, but it merits the question of how much the intervention was actually tailored to the specific linguistic demands of the social studies domain. For example, in professional development work with social studies teachers, Schleppegrell and de Oliveira (2006) helped teachers identify the linguistic features in historical texts that construct "time, cause, agency, abstraction, and interpretation" (p. 256). Combining this understanding of linguistic features with the research-based strategies used by Vaughn et al. (2009) may result in stronger comprehension gains.

The domain of science has generated a large number of studies examining science literacy (Cervetti, Bravo, Hiebert, Pearson, & Jaynes, 2009; Lemke, 2002; Schleppegrell, 2004a; Snow, 2010), but two recent studies in particular have demonstrated science language development with diverse populations of students. The first study, conducted by August, Branum-Martin, Cardenas-Hagan, and Francis (2009), assessed the effectiveness of QuEST (Quality English and Science Teaching) in a randomized, controlled experiment. The purpose of this work was to bolster research-based approaches for developing science language for English learners, who in previous research did not make the same gains as their monolingual peers. QuEST involved a combination of professional development and instructional material support for two multiweek units in science, and the instructional materials were based on the five Es approach (engage, explore, explain, extend, and evaluate).

All treatment students outperformed control students on the two curriculum-based, experimenter-designed measures, one on vocabulary knowledge and one on science knowledge. Effect sizes were reported as 0.30 or 0.37 for vocabulary knowledge (depending on the method used for calculation) and as 0.13 or 0.24 for science knowledge (depending on the method used for calculation). The researchers tentatively estimated that given the effect sizes and the potential sustainability of the learning gains, students involved in this type of instruction could make four years of gains in three years when compared with students experiencing traditional instruction.

In another study on science language, Brown, Ryoo, and Rodriguez (2010) investigated the potential of disaggregate instruction within a randomized control

design (*n* = 49). Brown et al. explained disaggregate instruction as "an approach that disaggregates teaching into conceptual and language components" (p. 1467). In other words, students have opportunities to build the conceptual knowledge and linguistic knowledge of science separately. Although this is a seeming contradiction to the assertion that language and content are inseparable (cf. Fang & Schleppegrell, 2008; Lesaux et al., 2010), the approach is based on a strong foundation of identity research. This work explores students' literate and academic identities as well as the psychological and social implications of sounding academic or like a scientist; such implications may be positive or negative depending on peer groups and sociocultural contexts. The intervention, then, helped students build concept knowledge first and language knowledge second as a way to circumnavigate potential identity issues with academic language. This line of inquiry, we suggest, merits further exploration. Furthermore, study results showed that "students taught using the experimental method demonstrated an improved ability to write using scientific language as well as an improved ability to provide oral explanations using scientific language" (Brown et al., 2010, p. 1465). On a measure with both multiple-choice and open-ended questions that tapped both science content and science language, the overall pre-posttest gain effect size for the treatment group was 1.74, while the overall effect size for the control group was 0.96.

These three interventions, much like those for general academic words, all situated academic vocabulary learning within the language of their respective content areas. Students simultaneously built disciplinary and language knowledge, although to differing degrees and with different types of outcome measures.

What We Still Need to Know

We can say with a reasonable level of confidence that the principles of vocabulary instruction derived from research on general vocabulary work for academic vocabulary as well. In the studies we described previously, rich instruction has been applied to academic vocabulary and found to produce gains in knowledge of the instructed words and, in several cases, gains in the ability to use the instructed words in writing and comprehending text. We argue that the success of such instruction derives in large part from the fact that it treats words as tools rather than as facts to be memorized. That is, the richness of rich vocabulary instruction consists largely in providing students with multiple opportunities to use the instructed words, both receptively and productively, generally in the context of discussion about academic content.

Research on academic vocabulary instruction to date has been promising, but there is still a great deal we need to understand about how and what types of word knowledge truly foster thinking, reading, writing, and speaking in academic contexts. In this section, we highlight some specific issues and topics where we think further research is especially needed.

Generalizability

The type of rich instruction that reliably leads to ownership of the instructed words is time-intensive; hence, the number of words covered by the interventions we have discussed is relatively small. One question raised by this limitation is the extent to which such instruction can generalize to broader measures of vocabulary knowledge and reading comprehension. Up to this point, evidence for such generalizability has been very limited. Despite consistent evidence for a strong correlation between vocabulary knowledge and reading comprehension (Anderson & Freebody, 1981), there is still very limited evidence, either for general vocabulary or academic vocabulary, that vocabulary interventions can produce gains in standardized measures of reading comprehension.

One reason for the lack of such evidence may simply be that a vocabulary intervention must last a long time to cover enough words to have a measurable impact on text not specifically related to the instruction. Likewise, if the intervention produces gains in word learning ability, such gains will only result in increased vocabulary knowledge after a sufficient interval for the students to apply their increased word learning ability to substantial numbers of words. In any case, further research is needed to determine under what conditions instruction in academic vocabulary generalizes beyond the specific words taught. We of course predict that any such generalization would be strongest for instruction that treats academic words as tools to be used for the communicative purposes of academic language. We also predict that generalization would be strongest for interventions that emphasize relevant aspects of metalinguistic awareness, especially morphological and syntactic awareness. Yet, these predictions remain to be tested.

Breadth Versus Depth

The small number of words that can be covered in rich vocabulary instruction also raises the question of when less intensive instruction is appropriate. Nonintensive vocabulary instruction has not been found to reliably increase comprehension (McKeown et al., 1985; Mezynski, 1983; Stahl & Fairbanks, 1986), but there are times when simple exposure to definitions or explanations of words can have a positive impact on word learning. It has yet to be clearly established,

however, under what conditions—for which types of words, for which types of students, and for which types of outcomes—such instruction is beneficial. Some studies (e.g., Penno, Wilkinson, & Moore, 2002; Silverman & Crandell, 2010) have indicated that students with larger initial vocabularies are more able to benefit from exposure to definitions. Students might profit more from limited instruction if they already knew a word with a similar meaning in their first language. Also, students already familiar with the communicative functions and syntactic patterns of academic language might well need somewhat less intensive instruction to achieve productive control over particular academic words.

Domain-Specific Instruction

We emphasize that more intervention research is needed that specifically scaffolds discipline-specific academic language as opposed to just applying generic literacy strategies to discipline-specific academic language. Strategies that are appropriate for building math academic language are likely quite different for those appropriate for building social studies language, and more research is needed to understand this. Heller and Greenleaf (2007) explained that although the use of general-purpose reading strategies, such as prereading, can be helpful across disciplines, students need instruction that is tailored to the unique language demands of the content areas.

Productive and Receptive Knowledge

Students need to both comprehend and produce academic language. Although the ability to produce academic language is valuable in its own sake, it is also possible that practice with producing academic language contributes to gains in comprehension.

Sentence combining is an example of an activity that has been demonstrated to increase students' productive control of syntactically more complex language ($d = 0.50$; Graham & Perin, 2007). However, sentence combining has typically focused on joining clauses through subordination, a type of syntactic complexity also common in the conversational register (Halliday, 1987). Thus, a typical sentence-combining exercise would involve having students transform this pair of simple sentences:

Sue read the book. Her friend had recommended it.

into the following single complex sentence:

Sue read the book that her friend had recommended.

We suggest using the practice of sentence combining as a technique for helping students understand nominalization. For example, these two sentences:

John investigated the problem. This led him to revise his theory.

can be combined to create the following sentence:

John's investigation of the problem led him to revise his theory.

Although we do not know of any studies using sentence combining as a way to help students understand nominalization, the success of the practice makes this a promising direction for future study.

A variety of other activities involving translation, paraphrasing, and code-switching have been suggested that would support students' productive mastery of academic language. For example, students can participate in activities asking them to translate back and forth between academic language and more informal or conversational registers. Teachers can model paraphrasing academic language into more accessible language as a comprehension strategy and then help students do the same (Fang, 2008; Wheeler, 2008). However, the effects of such activities on students' learning and use of academic vocabulary have been largely untested.

Fluency

As students build word knowledge in authentic contexts and see models for comprehending academic language, a complementary practice is to help students process academic text efficiently and automatically. Fluency, therefore, should be an instructional goal to pursue as they build their toolbox of words. Fluency is often thought of as a stage that students go through (e.g., Chall, 1996). However, readers who have become fluent with common syntactic patterns and basic letter-sound correspondences still need to develop fluency with the distinctive syntactic patterns, letter–sound correspondences, and morphology of academic language. Effective instruction in academic language must therefore take the development of fluency as one of its goals.

Because academic language is characterized by large numbers of morphologically complex words, recognizing the morphological structure of longer words is an important aspect of fluency development. Nagy, Berninger, and Abbott (2006) found that morphological awareness made a significant unique contribution to the rate (and for three out of four measures, the accuracy as well) of decoding morphologically complex words for students in eighth and ninth grades. The fact that Nagy et al. did not find such an effect in grades 4–7 suggests that the contribution of morphology to fluency develops relatively late. Although increasing attention has recently been paid to the role of morphological awareness in reading (e.g., Bowers, Kirby, & Deacon, 2010; Carlisle, 2010; Deacon,

Whalen, & Kirby, 2011; Goodwin & Ahn, 2010; McCutchen, Green, & Abbott, 2008; McCutchen, Logan, & Biangardi-Orpe, 2009; Reed, 2008), very little work has been done with students at the high school level.

Prosody is also an essential aspect of fluency, and the denser syntax of academic text may overwhelm some students' ability to translate the information provided by word order and punctuation into meaningful intonation. Being able to read text expressively—which requires the ability to chunk the text into meaningful units, and sensitivity to its syntax—is essential for comprehension. We believe that there is a need for research looking at the role of fluency in older students' reading, with special attention to the syntactic demands of academic language.

Developmental Trajectory of Academic Vocabulary

Little attention has been paid to how academic language typically develops through the K–12 years. There have been assertions that textbooks become more academic in nature around fourth grade (Biemiller, 1999), and we have addressed some of the developmental trends found with use of Latinate versus Germanic vocabulary (Bar-Ilan & Berman, 2007), use of derivational suffixes typical of academic language (Nippold & Sun, 2008; Tyler & Nagy, 1989), and use of nominalizations in writing (Berman, 2007). Furthermore, Hakuta et al. (2000) studied two school districts in California and two in Canada to determine how long it takes for students with limited English proficiency to gain oral proficiency and academic language proficiency in English. In both countries, the researchers found that "oral proficiency takes 3 to 5 years to develop, and academic English proficiency can take 4 to 7 years" (p. 1).

By piecing together this research, some trends about the development of academic language emerge. Proficiency with specific components of academic language seems to gain traction when students are 10–12 years old, and English learners take significantly more time to develop academic language proficiency than oral communicative proficiency. However, the field would benefit from a much richer body of research in this vein. Specifically, research on the sequence of academic vocabulary development, akin to the research by Biemiller and Slonim (2001) on the sequence of vocabulary development in low-achieving, typically achieving, disadvantaged, and normative populations in kindergarten through sixth grade, would be extremely beneficial in future intervention research on academic language.

Similarly, our understanding of how academic language manifests in elementary school classrooms is limited. Because textbooks become increasingly academic through the school years (Fang et al., 2006), middle school students need to have some level of academic language proficiency. Therefore, a better understanding of the academic language demands of elementary school classrooms would positively inform the agenda to support students' academic language proficiency. Honig (2010), Bailey & Heritage (2008), and Brock, Lapp, Salas, and Townsend (2009) have all offered frameworks for conceptualizing and supporting academic language at the elementary school level, but little data are available from empirical studies on the specific language demands of the various grade levels or on the academic language proficiency of elementary school students. A related issue that must be addressed with respect to academic language development is the changing nature of academic language through the grades, in that what is academic language for a first grader may be everyday language for a 10th grader. For example, a first grader learning to use the words *same* and *different* will find herself grappling with a similar level of abstraction as a sixth grader learning to use the words *analysis* and *evaluate*, yet the words *same* and *different* will pose no problem for that same sixth grader (Filippini, 2007). We suggest that future research exploring the development of academic language take into account the likely dynamic nature of what qualifies as academic language at the various grade levels.

Assessment

Recent calls to improve struggling students' academic language proficiency have identified academic language limitations as an important factor in academic success (i.e., Short & Fitzsimmons, 2007), particularly for English learners. The scholarly work identifying the language demands of academic language and the intervention research reviewed previously has laid a foundation of understanding for what academic words are and how best to teach them. However, as far as the most important next steps to follow in this line of research are concerned, we argue that the current state of the intervention research urges researchers to attend to both comprehension and productive use of academic language.

Indeed, the purpose of supporting students' academic language proficiency is to improve their overall achievement. Additionally, the intervention studies reviewed herein demonstrated gains in word knowledge and made correlational links to overall achievement. However, intervention research has to demonstrate a direct causational relationship between vocabulary gains and gains in academic comprehension or academic writing. Theoretically, gains in academic vocabulary knowledge should inform gains in these larger realms of academic literacy. It is possible

that the lack of a demonstrable relationship between academic vocabulary gains and academic reading comprehension and writing is a function of inappropriate assessments.

To determine whether gains in these areas are made, appropriate assessments must be used, and this is still an underdeveloped area in the field of academic language. Because it is generally agreed that academic language cannot be isolated from the disciplinary content it is used to convey (Lesaux et al., 2010; Schleppegrell, 2004b), it is unclear whether the best assessments for academic language interventions are measures of disciplinary knowledge or measures of those components of academic language that can be isolated for testing purposes. As an example of a component of academic language that can be isolated for testing purposes, the Vocabulary Levels Test (Schmitt et al., 2001) includes subtests for multiple levels of vocabulary knowledge related to word frequencies as well as a subtest for general academic vocabulary words.

Bailey, Huang, Farnsworth, and Butler (2007)have also developed a measure of academic language that taps academic language proficiency without relying on disciplinary knowledge. It is likely that both types of measures, disciplinary knowledge measures and academic language measures, are proxies for a student's overall academic language proficiency and should be used in combination to determine the effectiveness of academic language interventions. However, researchers need to identify specific goals for intervention studies that allow for a teasing out of the factors contributing to academic achievement. For example, a researcher in the domain of social studies who purports to investigate gains in social studies language and historical interpretative skills needs to include measures of

both of these constructs. Keeping these measures distinct will be difficult, however, because both will necessarily overlap with content vocabulary and content knowledge.

In relation to assessment of academic writing, which can tap both facility with academic language and disciplinary knowledge, the field needs an efficient process for analyzing student writing to measure productive use of academic language. The free, online software Vocabulary Profiler (English Centre, 2001) is an example of an efficient research tool for evaluating student writing, as it analyzes the occurrence and frequency of general academic words. However, given the premise of this review, that academic vocabulary is situated in a set of linguistic relationships within academic language, a more sophisticated process is needed to evaluate students' gains in academic language beyond word meanings. Such a process could measure the occurrence of prepositional phrases, nominalizations, and morphologically complex words, as well as lexical diversity (Chafe & Danielewicz, 1987) and lexical density (Eggins, 2004) in student writing.

Teacher Knowledge

Teachers need to model their understanding of academic language, and in doing so, they sometimes need to focus on specific structures that may contribute to or impede comprehension—for example, signal words such as subordinating conjunctions, complex noun phrases, and pronoun referent relationships (Schleppegrell, 2001, 2004b, 2007). By way of an example, we suggest potential guiding questions that teachers can ask themselves and their students as they work to derive meaning from academic texts. The Table offers

Table. Domains of Academic Language and Guiding Questions for Teachers

Academic language domain	Questions to drive instruction
Interpersonal stance	• Does the way this is written tell us anything about who the author is or what he or she believes? Why or why not?
Information load	• How many pieces or chunks of information are in this sentence?
	• Why is there so much information packed into this paragraph?
Organization of information	• What clue words and pieces of information did the author give us so we can follow where this paragraph is going?
	• Are there some clue words that tell us about relationships? For example, can we tell if there are smaller ideas/things that are part of bigger or overarching ideas/things?
Lexical choices	• Do we see some phrases that we don't often use when we speak? Why are they here? Are there many different words in this passage? Why do you think that is necessary? Some of these words are challenging – what do they tell us that easier words might not be able to tell us?
Representational congruence	• Do you see any words that represent a process or something happening? Why would the author use just one word to say that and not explain the whole process?
	• It doesn't look like we can tell who was doing the action in this sentence (e.g., "the telephone was invented"); why would that be the case?

*Note.*The five terms in column 1 are the five domains of academic language as explained by Snow and Uccelli in *The Cambridge Handbook of Literacy* (p. 119), by D.R. Olson & N. Torrance (Eds.), 2009, New York: Cambridge University Press.

examples of the questions that teachers can ask themselves and their students with respect to any academic text, discussion, or multimedia resources.

The value of such modeling seems clear, although we acknowledge that research is still needed to document its effectiveness. However, such modeling presupposes reasonably sophisticated knowledge about academic language on the part of the teacher. Schleppegrell (2004b) argued, and we agree, that "teachers need greater knowledge about the linguistic basis of what they are teaching and tools for helping students achieve greater facility with the ways language is used in creating the kinds of texts that construe specialized knowledge at school" (p. 3). Any interventions aimed at increasing students' control over academic language presuppose research that still needs to be done on what teachers know and do not know about the language demands of their content areas.

Conclusion

Words are tools; academic words are tools for communicating and thinking about disciplinary content. Interventions consistent with this premise have shown success in helping students learn—and more important, learn to use—academic vocabulary. There is still little evidence that existing interventions lead to generalized gains in academic vocabulary or to improved performance on standardized measures of reading comprehension. We believe that achieving such generalized gains will require a better understanding of what it means to teach academic vocabulary as tools, and this better understanding can result in part from the research pathways we recommend in this review. Although the scholarship reviewed here makes a promising foundation from which to continue this work, we hope to see the current momentum for studying academic language continue and even increase for the purpose of supporting students' access to and ability to create academic text.

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