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The Contribution of Morphological Knowledge to 7th Grade Students' Reading Comprehension Performance

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Abstract

In this study, we examined the role of morphology, an important yet largely understudied source of difficulty, in reading ability among 7th grade students in one junior high school in the southwestern United States. We sought to find out how much variance in reading ability is accounted for by these students' morphological knowledge, and whether skilled readers do in fact have higher levels of morphological knowledge than less skilled student peers. We found that students' sensitivity to the morphological structure of words accounted for 18% of the variance in these students' reading performance. We further found that skilled readers had a significantly higher level of sensitivity to the structure of words than did less skilled readers. In light of these findings, we offer recommendations for interpreting and using the results obtained to better understand and scaffold students' morphological knowledge, with the goal of helping promote students' vocabulary growth and reading comprehension performance.

The Contribution of Morphological Knowledge to 7th Grade Students' Reading Comprehension Performance

What is Morphology?

Morphology generally refers to how words are formed and how they fit together into the syntactic structure of sentences to create meaning. Knowledge of word formation, which consists of a mix of implicit awareness and explicit knowledge of the internal structure of words, is often referred to as morphological knowledge or morphological awareness. Following Carlisle (2010), we define morphological knowledge or awareness as a student's conscious awareness of the morphemic structure of words, and the ability to reflect on and effectively manipulate that structure.

Linguists make a distinction between two general classes of morphological formations in English (e.g., Curzan & Adams, 2006; Feldman, 1995). The first class pertains to words that differ in their derivational affixes but share a base root word or morpheme. For instance, the words "instruction" and "instructor" share the root word "instruct," but they are generally considered to be different words and to have different meanings. The second class of morphological formations refers to words that differ in their inflectional affixes and share a base root or morpheme, but are considered to be versions of the same words. For instance, the base root word "instruct" can retain its core meaning with inflectional affixes, such as 'ing' or 'ed,' but they have a new syntactic purpose indicating tense (how an event is located in time) and aspect (how an event is viewed relative to time), as in the words "instructing" or "instructed."

Another important distinction that linguists make between these two classes of morphemes is that while derivational formations often change the parts of speech, inflectional formations do not change word class membership to which the base word belongs. For instance, adding the suffix 'er' to the verb 'read' changes its part of speech from verb to noun. On the other hand, adding the

morpheme 's' at the end of the verb 'read' does not change its part of speech.

Because space does not permit a detailed explanation of the finer distinctions between derivational and inflectional morphology, we provide, at the end of this article, a set of recommended resources that readers will find helpful in gaining a fuller understanding and appreciation of morphology in terms of its theoretical and research underpinnings, its assessment, and its teaching.

What Role Does Morphology Play in Reading Ability?

Researchers agree that, as teachers, we should expect morphological knowledge and skills to contribute to children's vocabulary development and reading comprehension for the simple reason that morphological processing contributes directly to language comprehension. Carlisle (2004) noted that in the act of comprehending texts, "morphologically complex words contribute lexical, semantic, and syntactic information" (p. 333). In other words, readers who understand the morphemic structure of words have a distinct advantage not only in word decoding, but also in vocabulary and comprehension processes. Snow, Burns, and Griffin (1998) maintained that knowledge of morphology is important because it helps readers connect word forms and meanings within the structure of sentences. For example, "children learn that events having already occurred are marked by morphological inflections such as 'ed'. For children, sensitivity to morphology may be an important support skill in reading and spelling" (p. 74).

In asserting the significance of morphological knowledge, Carlisle (2010) noted that, "Access to morphemes and the richness of linguistic information about them (e.g., grammatical roles, semantic features) affects the facility of lexical processing, including learning new words" (p. 465). Understanding morphemes allows students to recognize relationships in words so that decoding for meaning may occur more effectively. In other words, learning to read and comprehend words and sentences requires sensitivity to the morphological, and by extension, the syntactic structure of sentences. While morphological knowledge and skills develops begin to develop in the early stages of language and reading development, researchers (e.g., Carlisle, 2004; Feldman, 1994, 1995) noted that these competencies are likely to become more explicit for students in the upper elementary, middle and high school grades for two reasons. First, during these years, most students tend to be more immersed

in reading, writing, and thinking about language because "morphologically complex words are sufficiently common in children's texts to make it likely that morphological processing plays a role in reading." (Carlisle, 2004, p. 329). Second, as students progress through the grades, they develop, through direct and indirect teaching, increasingly sophisticated metalinguistic skills, including knowledge about how words and sentences are formed, which enable them to read and write well.

The study of morphology and its effects on various aspects of reading and writing has significantly expanded during the past several years. Syntheses of this research (e.g., Carlisle, 2010; Feldman, 1995; Nagy, Berninger, & Abbott, 2006; McCutchen, Logan, & Biangardi-Orpe, 2009) indicate that the role of morphological knowledge has been implicated in a growing number of correlational and experimental research studies that have provided strong evidence for positive associations among morphology, vocabulary, and reading comprehension performance. Findings from these research studies provide evidence that morphological knowledge and skills contribute to students' ability to manipulate and analyze words. These skills are helpful in advancing their vocabulary development and achieving effective reading comprehension skills, especially when reading more complex text materials (e.g., Carlisle, 1995, 2004, 2010; Nagy, et.al., 2006; Singson, Mahony, & Mann, 2000).

Insights from research on morphology also indicate that students can be taught to improve their morphological knowledge and skills. For instance, children can learn word definitions by understanding the meanings of the various established prefixes and suffixes that attach to them (Carlisle, 2000; Anglin, 1993; Nagy, et.al., 2003). Knowing that the prefix 're' means 'do again' helps children learn new words that have the same prefix. In one study, Green, et.al. (2003) found that improved morphological knowledge gives students the ability to use the different parts of words to provide meaning so that they may more effectively decode, comprehend, and spell correctly. In addition to decoding, vocabulary, and reading comprehension, spelling ability is closely associated with morphological awareness as suffixes and prefixes often have unique spellings, such as "-tion" or "-ance," as they give meaning and purpose to words with these morpheme additions.

The Present Study

In light of the above findings relative to morphology and its role in reading

and writing development, we sought to examine the role or morphological knowledge in reading comprehension among a group of struggling 7th grade readers in one junior high school in the south central United States. Specifically, in this correlational study, we wanted to find out how much reading comprehension variance is accounted for by 7th grade students' morphological knowledge, and to determine whether skilled 7th grade readers show more sensitivity to the morphological structure of words than less skilled student peers. Specifically, we wanted to find answers to the following two related research questions:

How much variance in reading ability is accounted for by 7th grade students' morphological knowledge?

Do skilled 7th grade readers have higher levels of morphological knowledge than less skilled reader peers?

Method

Instructional Setting

The study took place in one middle/junior high school located in a socio-economically and ethnically diverse community (pop: 18,000) in the south central United States. The school has an enrollment of approximately 1100 students in grades 6 through 8 with a 25:1 average student to teacher ratio. The percentage of students eligible for a free or reduced price lunch is approximately 36%. The demographic profile of the students shows that 52% of the students were female and 48% were male. Ethnicities represented included 7% African-American, 13% Hispanic, 76% White, 1% American Indian/Alaskan Native, 1% Asian, and 3% two or more races.

Study Participants

A total of fifty-three students enrolled in two intact sections of seventh grade classrooms in one junior high school in the southwestern United States participated in the study. Student demographics included 26 Male, 27 Female; 2 African-American, 44 Caucasian, 7 Hispanic; 1 English learner, 1 dyslexic, and 3 students with special needs. Table 1 provides a demographic profile of the student population in terms of gender, ethnicity, language, and special needs designation.

Table 1: *Student Demographic Profile.*

Gender	
Male	26
Female	27
Total	53
Ethnicity	
African-American	2
Caucasian	44
Hispanic	7
Special Needs	
English Learner	1
Student with Dyslexia	1
Special Education	3

Data Sources

The data collected originated from a morphological knowledge test, and a reading ability test administered to all students in early March of the school year. We used the McCutchen Measure of Explicit Morphological Knowledge (McCutchen et al., 2009) to assess students' sensitivity to the morphological structure of words during reading. This assessment measure, which takes about 20 minutes to administer, consists of having students read a stem word and then write a morphological derivative of the stem to complete a sentence. For example, students are given a stem such as "farm" and asked to write the appropriate morphological derivative "farmer" to complete the sentence "My uncle raises cows and is a _____." The measure has a reported internal α reliability of .79.

We used the reading scores from the Texas Assessment of Knowledge and Skills (TAKS) test (Texas Education Agency, 2010) administered during mid-March of the school year to determine students' attainment of reading skills required under Texas education standards for the language arts. The TAKS test is a standardized criterion-referenced test used in Texas public and charter

schools to assess students' attainment of reading, writing, math, science, and social studies skills required under Texas education standards.

Data Analyses

We used multiple regression analyses to examine the contribution of morphological knowledge to students' reading ability. Prior to conducting the analyses, we screened the data to help ensure that the assumptions of normality, collinearity, and outliers have been met. We used t-tests to assess whether levels of morphological knowledge varied significantly among students varying in levels of comprehension. To examine differences in reading performance among students with differing levels of morphological knowledge, we reviewed students' reading performance on the TAKS test, and created a set of two groups differing in overall reading scores. Thus, we grouped the TAKS scores into percentiles and placed students whose scores fell in the 40th percentile or below to a low skilled reader group (Group 1), and those scoring at the 50th percentile of higher in the skilled reader group (Group 2). In an attempt to create two groups that were significantly different in terms of reading ability, we excluded students whose scores fell between the 40th and 50th percentiles.

Results

In this study, we sought to find out how much variance in reading ability is accounted for by struggling seventh students' morphological knowledge, and whether skilled readers do in fact have higher levels of morphological knowledge than less skilled student peers.

How much variance in reading ability is accounted for by students' morphological knowledge? The results of the regression analysis in Table 2 show a significant effect of morphological knowledge ($F= 3.98$, $p= .027$). The *R*-square value in the model (R-Square = .177) indicates that students' sensitivity to the morphological structure of words accounted for 18% of the variance in reading comprehension. These findings corroborate the important role morphological knowledge plays in reading comprehension.

Do skilled readers have higher levels of morphological knowledge than less skilled student peers? Using t-tests, we compared the levels of morphological knowledge between two groups of students varying in reading ability. As Table 3 shows, we found that skilled readers (Mean=26.23; SD= 3.15) had a significantly higher level of sensitivity to the structure of words than did less

Table 2: *Results of Standard Multiple Regression to Predict Reading Comprehension from Morphological Knowledge*

Variables	M(SD)	R	R-Squared	Beta
Morphological Knowledge	25.02 (3.27)	.421	.177	.421
TAKS Test	739.23 (81.20)			

skilled readers (Mean =23.40; SD= 3.13), and this difference was statistically different as indicated by the associated t-test t(35)=2.69, p=.011.)

Discussion

The results of this study indicate that seventh grade students' levels of morphological knowledge are positively associated with their reading performance on standardized criterion-referenced tests of reading ability. These findings provide additional support for a growing number of studies that have established a positive relationship between students' sensitivity to the structure of words and their ability to read with adequate comprehension (e.g., Carlisle, 2010; Green et al., 2003; McCutchen et al., 2009).

While the positive relationship between morphological knowledge and reading comprehension ability is not new, this research confirms that morphology, beyond students' orthographic and phonological knowledge, plays an important role in students' ability to recognize the structure of words, which helps determine their meanings within the context in which they are used. In other words, as Feldman (1994) noted "Morphology underlies the productivity

Table 2: *Differences in Morphology Knowledge by Skilled & Less Skilled Readers*

Variable	Skilled Readers (n=22) M(SD)	Less Skilled Readers (N=15) M(SD)	t(35)
Morphology	26.23 (3.15)	23.40 (3.13)	2.69 (p=.011)

of the word-formation process and word fit into the syntactic frame of a sentence." (p. 442).

However, we want to caution readers against interpreting this study's results as implying causal relations between student levels of morphological knowledge and reading comprehension performance. The existence of a positive relationship between these two variables gives us constructive clues that can help uncover reasons for low performance on these variables, but it does not reveal the underlying causes, which may be influenced by an array of other variables not measured by the assessments used in this study. In this particular case, the results can be most useful when they are considered in combination with diagnostic information gained from an analysis of the strengths and weaknesses gleaned from these assessments.

For instance, in reviewing student performance on the McCutchen Measure of Explicit Morphological Knowledge, we found that several students, particularly among less skilled readers, had difficulty completing sentences requiring the use of inflectional as well as derivational suffixes. Examples of errors in inflectional affixes include words with endings such as the plural morphemes '-s,' and the past tense marker '-ed.' Examples of errors in derivational affixes include morphological transformations from adjectives (e.g., *distant, deep*) to nouns (e.g., *distance, depth*) or verbs (e.g., *allow, sign*) to nouns (e.g., *allowance, signature*). In general, less skilled readers received lower scores, on average, on the morphology test than did their skilled reader peers. It is evident that several of the less skilled readers would benefit from explicit instruction in the morphemic structure of words, an important aspect of language understanding that clearly influences students' ability to read and write effectively.

Implications and Applications

The results of this study indicate that 7th grade students' levels of morphological knowledge are positively associated with their reading performance on standardized criterion-referenced tests of reading ability. These findings provide additional support for the relatively small but growing number of studies that have established a positive relationship between students' sensitivity to the structure of words and their ability to read with adequate comprehension (e.g., Carlisle, 2010; Green et al., 2003; McCutchen et al., 2009).

The findings of this study have important implications for classroom

instructional practices. Research indicates that students' knowledge of the internal structure of words helps them unlock the meaning of words and sentences in which those words are used Carlisle, 2010; Green et al., 2003; McCutchen et al., 2009). Enhancing students' understanding of the morphemic structure of words is in turn, associated with higher levels of reading comprehension performance. Results from the 2009 and 2011 National Assessment of Educational progress results indicate students who scored higher on NAEP vocabulary questions also scored higher in reading comprehension (National Center for Education Statistics, 2012). In light of these findings, we offer the following six recommendations or actions for upper elementary and middle grade teachers to consider when working to develop students' morphological knowledge and skills.

Recommendation #1: Assess students' knowledge of morphology. Because morphology has been shown to explain sizeable variance in students' reading comprehension, we suggest that it should be included in reading assessment and instruction. There are various methods used for assessing morphological knowledge that vary in terms of what aspects of morphology assessed (e.g., inflectional, derivational) and in terms of how these aspects of morphology are assessed (oral, written), [see Deacon, Parrila, and Kirby (2008)] for a review of these methods. For purposes of our study, we used the *McCutchen Measure of Explicit Morphological Knowledge* (McCutchen et al., 2009), which has sufficient technical adequacy (reported internal reliability=.79) and validity. The measure, which is available publicly at no cost, consists of 30 items requiring students to read a stem word and then write a morphological derivative of the stem to complete a sentence. This measure is relatively easy to use and interpret, and takes about 15-20 minutes to administer depending on students' reading ability levels. Other measures of morphological awareness can be found in Singson et al. (2000).

Recommendation #2: Use Assessment data to inform instruction. When the goal of reading instruction is to determine the sources of reading comprehension difficulties, consider using the results obtained from assessments such as the *McCutchen Measure of Explicit Morphological Knowledge* in combination with diagnostic information gained from other available formal or informal assessments. Proficient comprehension of text is influenced by various factors, including difficulty learning to read words accurately and fluently, low levels of metalinguistic awareness, insufficient vocabulary and

conceptual knowledge to support comprehension of text, lack of knowledge and skill in use of cognitive strategies to improve comprehension or repair it when it breaks down, and absence or loss of initial motivation to read (Cain, 2010).

Recommendation #3: Scaffold instruction to help students build knowledge of how to analyze and use inflectional and derivational word endings. Knowing that words are formed with meaningful word parts such as roots and affixes, how these word parts are related, and how they combine in spelling and writing helps students read words accurately, fluently, and with comprehension. It is estimated that more than half of the words in written English are morphologically complex, and that the majority of these words have meanings that can be inferred from the meanings of their component parts (Hiebert, 2013; Nagy & Townsend, 2012). It is important that students receive sufficient guidance as they learn to recognize the presence of morphemes in words through explanation, modeling, and guided practice. Graves (2006) recommends that students need a lot of scaffolding through modeling, coaching, prompting, encouragement, and feedback delivered at just the right time. For guidance on how to scaffold instruction in reading, see Graves & Graves (1994) and Hogan & Pressley (1997).

Recommendation #4: Use a consistent framework for organizing instruction aimed at advancing students' morphological knowledge. When teaching students to develop knowledge of the internal structure of words, and how that knowledge can be used to create meaning, it is important for teachers to use a framework as a guide for organizing instruction. This is done in part to help ensure instruction is implemented in a coherent manner, and also to help document whether students are learning word formation processes and using that knowledge to understand and create increasingly complex texts. Although there are several frameworks that have been shown to work quite well in helping teachers organize instruction in their classrooms for such purposes, we recommend using the Gradual Release of Responsibility framework developed by Pearson and Gallagher (1983), or a lesson format for teaching common prefixes developed by Graves (2006). The Gradual Release of Responsibility framework consists of four inter-related

components including verbal explanation, modeling, guided practice, and independent practice. This approach permits teachers to hold the majority of responsibility in teaching at the beginning of the lesson, but then slowly release that responsibility over to the students until learning is fully controlled by them. The Graves lesson format is fairly similar in that it includes reviewing, prompting, and guiding students to independent use of the specific strategies using common prefixes (e.g., *un, re*, *in*, *dis*, *non*, *mis*) and a strategy for using prefixes to unlock the meanings of unknown words. A typical lesson begins with a presentation introducing each prefix and illustrating its use with familiar and unfamiliar words, worksheets consisting of brief exercises requiring the use of the prefix in context-rich sentences, follow-up exercises requiring additional use and manipulation of the prefixes, and opportunities to independent or guided practice using the prefixes learned in authentic contexts such as text reading and writing. We encourage teachers to modify or adapt this framework depending on students' grade levels and needs. The recommended resources we describe below provide examples of how to plan, organize, and deliver instruction using these and other approaches. These resources also include lists of common inflectional and derivational affixes that will help guide instruction.

Recommendation #5: Integrate the teaching of morphological knowledge across the disciplines. In an effort to significantly advance students' morphological knowledge and skills, we suggest that language arts, science, social studies, and mathematics teachers work in teams as they plan to incorporate the teaching of morphology across their respective disciplines. Depending on grade level and student needs, teachers can begin by first determining what aspects of morphology knowledge and skills they should emphasize in their teaching, how much time they should devote to the teaching of these skills, and what instructional strategies they might consider using when teaching these skills. A noteworthy example of a cross-disciplinary approach to teaching words is Harvard University's *Word Generation* program that focuses on the teaching of academic vocabulary for middle grade students across the language arts, science, mathematics, and social studies classrooms (Snow & Lawrence, 2011; Snow, Lawrence, White, 2009). The program employs several strategies to help ensure that students learn words in a variety of contexts. Each day of the week for 15 minutes a day, teachers in different content areas teach the same 5 high utility target words in different contexts through

brief and engaging cross-content passages. The cross-content focus on a small number of words each week enables students to understand the variety of ways in which words are related, and the multiple exposures to words provide ample opportunities for deeper understanding." (For more detailed information about *Word Generation*®, visit the program's website at http://wg.serpmedia.org/index.html.)

Recommendation #6: Use existing resources to help build your morphological content and pedagogical knowledge. Interestingly, the teaching of morphological knowledge, although important, is often omitted from instruction in teacher education programs, and in school curriculum materials. In addition to programs such as Word Generation, we recommend a set of annotated resources (see Appendix), which support the development of students' morphological knowledge and skills.

Summary & Conclusions

In summary, the findings of our study are consistent with a growing body of research linking students' morphological knowledge and skills to important literacy achievement outcomes, particularly vocabulary development and reading comprehension performance. This body of research indicates that students' understanding of how words work, particularly as they relate to inflectional and derivational morphology, is meaningfully associated with their ability to read and understand what they read. This research further indicates that students with poor morphology knowledge are more likely to have reading comprehension difficulties than peers with higher levels of morphological knowledge. A related research finding is that at nearly all grade levels, students benefit from instruction focused on the teaching of morphological knowledge and skills.

Strengthening students' language skills, including but not limited to morphology, is important, particularly in light of the expectations of the Common Core State Standards for English language arts, which call for additional language use, and increasingly sophisticated language use above the standards that have been previously used in schools (National Governors Association, 2010). Putting the common-core standards into practice in

classrooms presents a substantial change for language arts and content area teachers in the nation's public schools; but for educators who work with all students, including those who speak English as a second language (i.e., English learners), the shifts in instruction are expected to be even more complex. Because language demands grow significantly across the grades, instruction will have to move well beyond the teaching of fundamental components of reading to include instruction on how to read and comprehend linguistically varied and complex texts, construct text understandings, and communicate ideas in writing.

Our suggested recommendations and actions relative to the assessment and teaching of students' morphological knowledge and skills are designed to assist teachers across the language arts, science, mathematics, and social studies disciplines in assessing students' levels of morphological knowledge, and designing instruction that addresses the needs of these students. Incorporating recommendations such as these and others described in some of the recommended resources can and should help enhance classroom instructional practices and enhance students' achievement outcomes.

We recommend that teachers representing the language arts, social studies, science, and mathematics disciplines adopt a similar strategy as it has been found to significantly impact students' vocabulary development and content learning. We suggest that teachers across these disciplines work together to coordinate the teaching of morphological knowledge and skills. Depending on grade level (upper elementary, middle or high school), student needs, and instructional schedules, teachers can determine what aspects of morphology to teach, which instructional strategies to use, and how much time to devote to such teaching. Carefully coordinating the teaching of morphology across the disciplines provides an opportunity for students to learn about words and how they are used to make meaning in diverse contexts.

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language arts & literacy in history/social studies, science, and technical subjects. Washington, DC: Retrieved from http://www.corestandards.org/ELA-Literacy/.

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Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children.* Washington, D.C.: National Academy Press.

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Appendix

Recommended Resources to Support the Development of Students' Morphological Knowledge

Bear, D. Invernizzi, M., Templeton, S., & Johnson, F. (2011). *Words their way: Word study for phonics, vocabulary, and spelling instruction.* New York: Pearson.

This book presents a dynamic instructional approach to word study, providing a practical way to study words with students in the classroom. It provides the tools literacy educators need to carry out word study instruction aimed at engaging K-12 students in learning about how words work and how this knowledge supports literacy learning.

Curzan, A. & Adams, M. (2006). *How English works*. New York: Pearson.

In this book, Curzan and Adams provide a reader-friendly, comprehensive and detailed explanation of how various components of language operate, including but not limited to the sound system of language or phonology, word formation or morphology, word meanings or semantics.

Carlisle, J. F. (2010). An integrative review of the effects of instruction in morphological awareness on literacy achievement. *Reading Research Quarterly*, *45*(4), 464-487.

In this synthesis of research, Carlisle provides an extensive review of research on the effects of instruction on morphological knowledge and skills on various aspects of reading and writing ability across a range of grade levels and type of students.

Graves, M. F., Ruda, M., Sales, G., & Baumann, J. F. (2012). Teaching prefixes: Making strong instruction even stronger? In J.F. Baumann & E. B. Kame'enui. *Vocabulary instruction: Research to practice* (pp. 95-115). New York: Guilford Press.

In this chapter, Graves, Ruda, Sales, and Baumann describe a research-based approach to prefix instruction, and provide a well developed, deeply described five-day lesson framework aimed at building students' understanding and use of prefixes when reading and writing.

Hiebert, E. (2000-2015). *TextProject, Inc.* http://www.textproject.org.

TextProject.org provides free high-quality resources including strategies, tools, and texts that are designed to help bring struggling readers to high levels of literacy. The website also has a variety of other open-access, online resources, including vocabulary lessons and webinars.

Kieffer, M. J., & Lesaux, N. K. (2007). Breaking down words to build meaning: Morphology, vocabulary, and reading comprehension in the urban classroom. *The Reading Teacher*, *61*(2), 134-144.

In this article, Kieffer and Lesaux report findings of a study aimed at teaching students to understand morphology as a means of improving reading comprehension performance, particularly for students with limited

English proficiency. They offer a set of principles for teachers to use when integrating the teaching of morphology with literacy instruction.

Feldman, L.B. (1995). *Morphological aspects of language processing*. Hillsdale, NJ: Erlbaum. In this edited volume, language and literacy experts address the development of morphological awareness and its role in the acquisition of reading skills among a diverse set of readers.

Nagy, W., & Townsend, D. (2012). Words as Tools: Learning Academic Vocabulary as Language Acquisition. *Reading Research Quarterly*, 47(1), 91-108.

In this article, Nagy and Townsend discuss the role of academic vocabulary within academic language, examine research on academic vocabulary, and offer recommendations on how to improve instructional practices when using words as tools for communicating and thinking about language across the disciplines.

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