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## Morphological Knowledge and Learning to Read in English

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The attention given to phonology has overshadowed that given to morphology. Evidence is substantial, however, that knowledge of morphology is critical for fluid and meaningful reading (Carlisle, 2000; Nagy & Anderson, 1984; Tyler & Nagy, 1990; White, Power, & White, 1989). Already in the primary levels of American reading textbooks, compound words and words that contain inflected endings and affixes are prevalent (Hiebert, 2008). The morphological interconnections among words become even more frequent as readers move into the content-area texts of middle grades and beyond (Nagy & Anderson, 1984).

For researchers and educators who are aiming to ensure fluent, meaningful reading of English by individuals—whether children who are first-time readers or adolescents and adults who are already reading in another language--the morphological structures that are common to English require attention. Our interest in this context is to underscore what readers of English need to understand about the manner in which morphemes join together to form new words. The historical roots of English mean that there are two common ways in which new words are generated. A prominent system from the Romance layer of English involves the addition of prefixes and suffixes to root words and the prominent way of creating new words within the Germanic layer of English involves combining two or more root words to create a compound word (Barber, 2000). While the two structures are part of the other layer (i.e., compounds

consisting of Romance words and derivational morphemes added to German-origin words), these two types of morphological structures are used most prolifically with the words that have origins in the respective languages.

While attention to morphology is increasing within the practitioner and research communities, this attention is frequently to the derivational aspects of English. There is much to be learned about how derivational morphology can best be taught and learned. However, the number of compounds entering English has increased substantially (Bauer & Renouf, 2001). Since English compounds are not necessarily marked by joining or hyphenating, many words that native speakers of English may recognize as compounds may challenge readers who are new to English.

Our interest in this chapter lies in clarifying what is known about the development and instruction of morphemes as it influences reading development. For both derivations and compounds, we are going to ask three questions: (a) what is the phenomenon and how extensive is it in English, (b) what do we know about its development in schoolchildren and its relationship to reading development, and (c) what does research have to say about effective instruction and ways of intervening when students' development is not progressing appropriately.

## **Derivations**

### *Definitions and descriptions*

Derivational morphology refers to creating words by adding prefixes and suffixes to root words. While it is within the Romance/Latin layer of English that derivational morphology is most productive (e.g., *attend, attention, attentive, inattentive*), prefixes and suffixes are applied to words of Germanic origin (e.g., *friend/friendship, mind/mindful*) (Henry, 2003). Further, the major means of word building within the Greek layer of English is the combination of two

semantic roots (e.g., *eco-* and *-logy*). Since the Greek roots traditionally do not function independently, teachers sometimes refer to these as prefixes and suffixes.

The number of words with derivatives gets increasingly larger, as the complexity of content and text increases. Nagy, Anderson, Schommer, Scott, and Stallman (1989) estimated that, in the middle grades and beyond, “more than 60% of the new words that readers encounter have relatively transparent morphological structure—that is, they can be broken down into parts.” (p. 279). The potential connections between words, however, are exacerbated by three potential changes between a derived word and the root word: (a) grammatical class, (b) pronunciation, and (c) meaning.

The addition of a suffix typically changes the grammatical class (i.e., noun, verb) of the affixed word. While *attend* is a verb, the addition of a suffix produces a noun (e.g., *attention*) or an adjective (e.g., *inattentive*).

There can also be changes in the pronunciation of words affected by the addition of an affix. Among the phonological changes that can occur between a root word and affixes are alternations in the vowel and/or consonant as well as syllable stress (Moats, 2000). The addition of neutral derivational suffixes (e.g., *-ment*, *-able*) do not change the pronunciation of the root word (e.g., *placement*) but the addition of non-neutral suffixes (e.g., *-ion*, *-sion*, *-tion*) typically triggers changes in the consonant or vowel segments of the base and may affect stress placement (e.g., *pronounce/pronunciation*) (Carstairs-McCarthy, 2005).

The effects on meaning of adding prefixes are typically more substantial than with suffixes. Prefixes have specific meaning and consistently make a substantial change to the meaning of a word (e.g., *attentive*, *inattentive*). Suffixes tend to provide a grammatical distinction such as signifying a shift from noun to adjective (e.g., *zeal/zealous*). Particular

suffixes are used commonly and have fairly consistent meanings. For example, verbs are made by adding *-ize* and *-ify* to nouns, adverbs with *-ly*, and adjectives with *-al* and *-ful*.

*Developmental progressions*

While there is still much to learn about the development of morphological knowledge and its application and use in reading, several conclusions can be made from the existing research. First, most English-speaking children acquire morphological awareness along a fairly consistent developmental progression. Native English speaking children have generally acquired inflected forms before they start school and also know some derivational suffixes such as *-er* (e.g., *runner*, *teacher*) (Anglin, 1993; Berko, 1958; Tyler & Nagy, 1989). From first through fifth grades, students learn approximately 4,000 base words and about 14,000 derived words (Anglin, 1993). Explicit knowledge of the morphemic structure of words continues to develop through the high school years (Anglin, 1993; Carlisle, 2000; Tyler & Nagy, 1989) and even through adulthood (Carlisle & Katz, 2006).

Second, variation in morphological awareness among students at any level is considerable. Even within a sample of native English speakers in schools with low percentages of low-income students, Nagy, Berninger, and Abbot (2006) reported substantial variation among students in the speed with which students through tenth grade decoded morphologically related words.

Third, morphological knowledge fluctuates as a function of the features of words. Carlisle and Katz (2006) concluded that ability of even adults to use knowledge of the base word to understand a derived word depends on a number of factors. Measures of familiarity, including derived and base word frequencies, family size, average family frequency, and word length formed two factors, one representing morphemic constitution and the second representing

exposure to the word family; both factors accounted for significant variance in reading of derived words.

To the extent that a morphologically complex word lacks transparency in sound, spelling, and meaning, its morphological composition can go unnoticed by a large portion of all of the children who encounter it (Templeton & Scarborough-Franks, 1985). Even with orthographic and phonological abilities accounted for, morphological awareness and vocabulary knowledge correlate highly. Nagy, Berninger, Abbott, Vaughn, and Vermeulen (2003) reported that this correlation was highest at grades 4 and 5 ( $r = .83$ ). Beyond this level into high school, the correlation decreased slightly but morphological awareness contributed to reading comprehension, independent of its relation to vocabulary (Nagy, Berninger, and Abbot (2006).

#### *Instruction and Interventions*

The National Reading Panel (NRP) (NICHD, 2000) summarized the results of approximately 130 studies of phonological instruction. By contrast, Carlisle (2008) located 16 studies on the instruction of morphology. Of these 16 studies, six were conducted in languages other than English (Dutch, Spanish, Chinese). Since the morphological features of these languages are unique, the results of these studies cannot be generalized to morphology instruction in English. Of the 10 studies conducted in English, one was conducted with deaf and hard of hearing students (Bow, Blamey, Paatsch, & Sarant, 2004) and another with students with severe learning disabilities (Berninger, Nagy, Carlisle, Thomson, Hoffer, Abbott, et al, 2003). Another group of studies emphasized morphology in spelling (Bergisdottir, Nunes, Pretzlik, Burman, Gardner, & Bell, 2006; Nunes, Bryant, & Olsson, 2003)—findings that are difficult to generalize since facility with morphological knowledge differs in productive and receptive modes (Carlisle & Katz, 2006).

In addition to the five studies (Baumann, Edwards, Font, Tershinski, Kame'enui, & Olejnik, 2002; Baumann, Edwards, Boland, Olejnik, & Kame'enui, 2003; Carlo, August, McLaughlin, Snow, Dressler, Lippman, Lively, & White, 2004; Henry, 1989; Parel, 2006) that were conducted in English, our review for this chapter produced a handful of additional studies (Graves & Hammond, 1980; Nicol, 1980; Wysocki & Jenkins, 1987). An overall conclusion of this research is that instruction regarding the morphological structure of English typically proves to be advantageous for students. Even so, the diversity of linguistic focus and instructional activities and methods means that few definitive conclusions can be about what aspects of morphology most benefit from instruction and how this instruction can best occur.

One question, in particular, pertains to whether instruction should focus on the meanings of specific affixes or take a more metalinguistic stance that develops awareness of affixes and of root words. The former perspective has dominated in the existing research. For example, Nicol (1980) taught eight prefixes to fourth through sixth-grade students in three 30-minute sessions. On both immediate and delayed transfer tests, instructed students performed significantly better than an uninstructed control group. Further, students of all achievement levels (high, middle, low) and at all three grade levels benefited from this instruction.

Baumann et al. (2002) compared students' performance in four treatments: prefix content, context clue strategies, a prefix-context clue combination, and typical instruction. Students were more effective on the content that they were taught. That is, students who were taught prefixes used prefixes more effectively, whereas students who were taught context clues performed better on the test of context clues. Those students who received the combined treatment, however, did as well on both tasks as those students whose instruction had focused on one or the other of the content.

In a second study, Baumann et al. (2003) taught prefixes and suffixes (a total of 20 affixes) plus the use of a context strategy within social studies classes. The affix/context clue instruction was compared with instruction in the key vocabulary of the social studies units. The affix/context group outperformed the vocabulary only group on tests of taught affixes in novel words, while the vocabulary only group had higher performances on the specific vocabulary of the social studies units. On measures of social studies content and on a comprehension measure, the two groups did not differ. Further, students of high and low proficiency benefited equally from both forms of instruction.

A study conducted by White et al. (1989) focused on a set of highly frequent prefixes and a strategy for removing the suffixes of words. Students who received the instruction outperformed uninstructed control students on a test that required them to extract root words by removing a suffix, a test identifying the meaning of the prefixed word when given the base word, and a test on the meanings of the prefixes. The strategy for suffix removal taught in the White et al. (1989) study is moving in the direction of what we might term a metalinguistic approach where the emphasis is on students' awareness of affixes and ways to think about those affixes rather than on instruction of the meanings of affixes.

Another form of metalinguistic awareness of morphology has been developed by Henry (1989). In this work, students have been taught to distinguish between letter-sound correspondences and morpheme patterns on the basis of words' origins (Anglo-Saxon, French/Latin, Greek). Those students receiving instruction based on word structure and word origin learned more about the structure of English orthography and also made greater gains in reading and spelling performance than control students.

Henry's (1989) findings suggest an integrative approach to teaching morphology where

the emphasis is not on defining prefixes but on using the prefixes in the context of words, sentences, and texts to understand the meanings of words. Such a strategy places priority on gaining a sense of what morphemes do to the meanings of words rather than ensuring that every prefix has been taught and learned. Graves (2006) suggests that the 20 most frequent prefixes identified by White et al. (1989) can be taught across several grade levels, beginning with grade four. He hypothesizes that this instruction will likely be sufficient in ensuring that students have sufficient morphological awareness to handle the words in grade-level texts.

Even more so than with prefixes, a metalinguistic stance toward suffixes is needed. The meanings of suffixes are sufficiently diverse and, coming at the end of the word, mean that students have already had a clue to word meaning from the root word and any prefixes. With respect to whether the content of suffixes should be taught, Graves (2006) cautions that most derivational suffixes are abstract and difficult to explain, making explanations to elementary students difficult and the result often confusing for students. Graves reminds us of Thorndike's (1941) advice that systematic instruction in derivational suffixes ought to be reserved for secondary students.

### *Compound Words & Phrases*

#### *Definitions and descriptions*

While compounding forms the widest-spread morphological technique to create words and is present in all languages (Dressler, 2006), it is more prevalent in some languages than in others. In German—the language most closely associated with English historically—compounding is the primary means of forming new words. While many words in academic text have French and Latin origins, 85% of the 1,000 most common words have German or Danish roots (Williams, 1975). Many of these words are used in compound words (e.g., *over*, *under*, *to*).

The Germanic roots of English are the basis for forming a compound word from two or more autonomous words (e.g., *cupcake*, *bean counter*). Only a small group of words called the “cranberry morphs” belong to the type of compound words in which all constituent words are not autonomous (e.g., *cran-berry*, *boysen-berry*). A set of compounds with bound morphemes is labeled as neoclassical compounds (Dressler, 2006) (e.g., *heliography*, *bibliography*).

New words continue to be added to English at a rapid pace through compounding. Bauer and Renouf (2001), in examining a database of approximately 9 million words from a British newspaper (*The Independent*) for neologistic compounds, identified approximately 3,000 from 1988 to 1998. In fact, provided there is a conceivable meaning, a limitless number of English compounds could be formed (Carstairs-McCarthy, 2005).

Within the compound words that take the Germanic structure, conventions vary: one word (*blackboard*), hyphenated (*stir-fry*), or two or more separate words (*toy factory*). Compounds also represent different grammatical classes: compound verbs (*freeze-dry*), compound adjectives (*blue-green*) and compound nouns (*glowworm*) (Packard, 2000). Compound nouns are the most common and the noun-noun (*text message*) is the most common of the compound nouns (Bauer, 1987), although other word classes are also used to form compound nouns, including verb-noun (*swearword*), adjective-noun (*faint heart*), and preposition-noun (*underarm*).

Verb compound verbs can be formed in a number of ways as well: two verbs (*stir-fry*), a noun/verb (*sportswear*), adjective/verb (*dry-clean*), or preposition/verb (*undercut*). Of these verb compounds, only the preposition/verb is common. Adjective compounds are also formed by joining different grammatical classes: noun/adjective (*winter green*), two adjectives

(*squeaky-clean*), and preposition/adjective (*overaggressive*). As with compound verbs, the preposition/adjective compound is the most common.

Another distinction of compound words has to do with their meaning (Miller, 1996). Of the four semantic classes of compound words, endocentric compounds are the most straightforward. Endocentric compounds basically take on the meaning of the final word in the pair with the first word modifying it (e.g., *doghouse*, *rainwater*). Exocentric compounds do not have a primary or headword and their meanings are typically not evident from the meanings of the constituents (e.g., *white-collar*, *mushroom*). Copulative compounds have two semantic head words that are incorporated into the meaning of the compound word (e.g., *sleepwalk*, *bittersweet*), while appositional compounds bring together two attributes or descriptions of the same referent that are, in themselves, not the same (e.g., *actor-director*, *maidservant*).

There is also a form of compounding common to all languages that becomes increasingly more critical, especially for those learning English as a second or third language—the complex phrases of academic texts. For all intents and purposes, phrases such as *climate change* or *behavior pattern* function as compound words in academic subject areas. Even in the primary grades, these phrases are frequent as evident in Marzano's (2004) list of content area vocabulary. In science, 32% of grade K-2 vocabulary consists of two or more distinct words but are presented as a single idea (e.g., *seasonal change*). In the general history terms, many words are recognizable as compound words (e.g., *cowboy*, *newcomer*) and an additional 36% consist of two or more words that are not co-joined or hyphenated (e.g., *ancient times*, *human rights*).

We are going to describe these phrases as compound phrases rather than as phrasal compounds which, in linguistics, have come to have a specific meaning (e.g., *winner-take-all struggle*). The compound phrase, as we define it, has a looser association than the phrasal

compounds that are a focus of linguistics. Writers and specialists, however, use these compound phrases with the expectation that their readers—even young students as well as English Language Learners (ELLs)—give a unique meaning to their contents.

*Developmental progressions*

Much of the research on the learning and instruction of morphology has been done with inflections and derivations, likely because of the role that these two processes have in western languages (Zhang, Anderson, Packard, Wu, & Tang, 2007). In doing the research for this chapter, we found frequent comments that students develop knowledge of compound words with ease. Evidence for this statement, however, was scant. To proficient readers of English, many compound words may appear straightforward in meaning. For novice readers and ELLs, the structure and meanings of these words may not be as evident. In one of the few studies that have been done on the factors that influence compound processing, Juhasz, Starr, Inhoff, and Placke (2003) considered the effects of compound familiarity and sentence type on compound processing. They found that compound words with a high frequency root word were read faster than mono-morphemic words matched for length and frequency. Further, the size of the morphological family and the number of high frequency morphological family members of the root word significantly affected compound word reading time.

One of the few studies to consider the nature of compound knowledge to reading comprehension was conducted by Nagy et al. (2003). They administered a measure developed by Berninger and Nagy (1999) in which students are asked to identify names for novel situations (e.g., *Which is a better name for a bee that lives in the grass, a grass bee or bee grass?* Expected answer: *grass bee*). Students' performances on this task made a unique contribution to reading

comprehension above and beyond vocabulary knowledge for students who ranged from at-risk second graders to middle-school students.

Most of the research on compounding has involved cross-language comparisons (see, e.g., Libben & Jarema, 2006), due to the differences in compounding across languages. One particular language of interest has been Chinese because of the prominence of compounding in its morphology and the presence of few inflections and derivations (Packard, 2000). To test the hypothesis that fluency in compounding is more important in learning to read in Chinese than in English, Zhang et al. (2007) asked Chinese and American second-, fourth-, sixth-graders, and college undergraduates to complete a compound structure analogy task in their native language. Half of the compounds were familiar and half novel. Chinese participants at every age and on every type of compound performed better than their American counterparts.

#### *Instruction and interventions on compounding*

Instruction of compound words can be assumed to have been part of at least some of the instructional studies of morphology in languages such as Danish and Chinese that Carlisle reviewed (2008) since compounding is a primary morphological structure in these languages. In relation to studies of the instruction of compounding in English, however, the studies have been sparse. We found one study where the explicit goal was to teach compound words—and this study was conducted with Chinese speakers: Zhang, Anderson, Li, Dong, Wu, & Zhang (in press). The authors claim that theirs is among the first experimental demonstrations of cross-language transfer of an aspect of compounding. Our review of the literature suggests this well may be the *first* instructional study focused specifically on compounds. In the Zhang et al. study, Chinese fifth graders received instruction in the morphology of compound words in either Chinese or English for 45 minutes. They then completed Chinese and English versions of a

compound word structure analogy task. Compared with children who received no instruction, children who received instruction in Chinese were able to transfer knowledge they had acquired of compound types in Chinese to comparable types in English. Reverse transfer from English to Chinese was found among children with high reading proficiency.

The research literature is not the only context in which attention to compounding in English has been sparse; that is also the case within the pedagogical literature. Pages devoted to instruction of compound words in volumes on vocabulary instruction (e.g., Henry, 2003; Moats, 2000) are few and, in some cases, lacking altogether (Graves, 2006). One explanation for this lack of attention is suggested by Henry's comment that the meanings of compound words are fairly straightforward. While this may be true for some compound words, it is not the case with many compound words. For example, two compound words that are relatively similar can differ substantially in their meanings (e.g., *runway*, *runaway*). Further, the reasons for the choices within compound words are not necessarily obvious (e.g., *cowboy* but not *cattleboy*; *cattlemen* but not *cowman*).

What form does effective instruction in compound words take? We have found no instructional studies that focused specifically on becoming more adept in awareness of compound words in *English*. But, while the literature is small, there is a growing body of evidence that suggests directions for instruction that will support morphological awareness of compounds in English.

When the focus is on supporting morphological awareness, the intent is not to ensure that every compound word is introduced but rather that students learn that words can combine in different ways to form new words. Often, when compound words are discussed in pedagogical sources, activities that can best be described as word play are recommended. Activities such as

creating or choosing definitions for novel items (as evident in Berninger and Nagy's (1999) assessment task of *bee grass* or *grass bee*) illustrate word play. While playful perspective is appropriate with compound words, they are simply too important a morphological structure in English to be marginalized to a "fun" activity that is left for rainy Friday afternoons in February.

Other than inflected endings, compound words are typically the first multisyllabic words that students experience. When we examined the first-grade texts of a prominent core reading program (Afflerbach et al., 2007), we found a high percentage of multisyllabic words, many of which were compound words. A first aim of instruction might be to show how highly prolific words—at least in the texts of beginning readers—can be generated. Particular words among the 100 most frequent—*where, every, to, day*—are particularly prolific within compound words and could be part of a curriculum on compound words. As students move toward the end of the elementary years and into the junior and secondary school, lessons could focus on particular classes of compound words. These lessons do not need to be overly didactic but can make explicit fundamental distinctions such as the underlying structures (e.g., noun + noun, verb + noun). These lessons can also be conceptual by examining the creation of new vocabulary that accompanies a new invention or field (e.g., *aircraft, airplane, spacecraft, space shuttle*).

Ganske (2008) has described the study of compound words as an excellent means of introducing students to words of more than one syllable. We are confident that the single most lacking area at the present time in beginning reading instruction in the U.S. is the failure to guide students in strategies for dealing with the many multisyllabic words in their texts. Attention to compound words in the primary grades represents the first stage in ensuring that students are developing confidence in and strategies for decoding and understanding the meaning of multisyllabic words.

## Conclusion

There is much to learn about the learning of English, particularly about what can and should be taught with regard to morphology. What is beginning to happen—and it can't happen soon enough or extensively enough—is attention to morphology. To become a proficient reader of English requires that individuals become adept with and learn about its unique morphological systems that include both the derivational morphemes of Romance languages and the compounds of Germanic languages. As morphology is increasingly drawing the attention of researchers and educators, it is the derivations of the Romance contributions to English that are receiving attention. This attention is sorely needed. But, at the same time, the human proclivity to invent and create is evident in the compounds of English. Language evolves daily and the addition of ideas, interpretations of ideas, and inventions are represented in language and also evident in social discourse as individuals invent and reinvent language. As the premiere language of Earth at the current time, English is a primary context for this invention and reinvention. Manipulating existing words into new phrases and orders is one of the ways in which this invention and reinvention occurs. For individuals learning to read in English, we propose, developing an awareness of compounding is essential. We would go so far as to say that, even at the earliest stages of reading, where compound words are among the first multisyllabic words that students encounter, deliberate instruction on compounding is essential.

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