

**Vocabulary Through Morphemes:
Suffixes, Prefixes, and Roots for Intermediate Grades**

Research base and curriculum overview

Susan M. Ebbers

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Advance Organizer

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CURRICULUM GOALS

One of the goals of *Vocabulary through Morphemes* is to learn the meanings of key *morphemes* (prefixes, roots, suffixes). However, the ultimate goal is for students to confidently infer unknown word meanings during independent reading in any subject area. Students can be taught to make this inference by combining information gleaned from the outside clues—the surrounding context around the word—and the inside clues—the morphemes inside the word. This is called the outside-in strategy (Ebbers & Denton, 2008). Effective teachers keep this key goal in mind, modeling the outside-in strategy frequently in order to help students become adept. Teachers can use a think-aloud procedure to help enable transfer of knowledge of affixes and roots to all reading materials across the curriculum. Thus, even though students eventually memorize the meanings of key prefixes and roots and become familiar with derivational suffixes, the greater goal is eventual independent application of this material to all texts. Another important goal of this program is to develop *interest* in words, etymology, word origins, analogies, derivatives, and word relationships. Interest should increase as self-efficacy increases, as students become more knowledgeable about affixes, roots, and word relationships. Interest is an important aspect of morphological awareness.

Note: This curriculum is not a final authority on etymology, morphology, or linguistics in general. Numerous sources were consulted when writing this book. At times, linguistic information differed slightly. In that case, the interpretation most practical for improving vocabulary was chosen.

CURRICULUM OVERVIEW

Vocabulary through Morphemes (VTM) takes about 15 minutes for about 90 days and reflects the academic content standards for English/Language Arts spanning grades 4-12 in many states, including California, Texas, and Florida. VTM targets specific learning expectations for structural analysis, affixes, roots, analogies, and word relationships. Grade-level expectations pertaining to word origins (including etymologies and the history of the English Language), shades of meaning, and use of context clues are also addressed in this program. VTM embodies academic language and incorporates the scholarly meanings found in the *Academic Word List* (Coxhead, 2000), promoting comprehension of the formal language used in lectures, texts, and assessments. Most of the Greek roots taught in VTM are the basis for scientific terms (*biomass, thermonuclear, hydroscopic*). Although VTM is not strictly a phonics program, students learn to decode longer words in morphemic chunks. Spelling improves, because word formation rules are peppered throughout, such as “drop the final –e before adding the suffix –ive.” Students practice “morphological math” when they combine multiple affixes to a root, making all the necessary spelling adjustments as they do so and successfully reading long, morphologically complex words.

RATIONALE: HOW AND WHY THESE MATERIALS WERE WRITTEN

English is thought to be the most complex of all the European languages, in part because of its mongrel mixture of Greek, Latin, French (which is based in Latin) and Germanic roots (Frost, 2005; Seymour, 2005). In addition, English is generally thought to have significantly more words and expressions than any other language (Global Language Monitor, 2009). This is useful if you are a writer in search of the perfect phrase, but for striving readers and language learners, it can be a nightmare. These two factors—the mixed complexity of English spellings and the size and scope of the lexicon—combine to create a major challenge for students and teachers alike. *Vocabulary through Morphemes: Suffixes, Prefixes, and Roots for Intermediate Grades* was written to address that challenge.

Vocabulary through Morphemes was designed to promote structural analysis, referred to hereafter as morphological awareness (MA). *Morphology* refers to the structure of words through the smallest elements of meaning—*morphemes*—prefixes, roots, base words, and suffixes. *Morphological awareness* may be viewed as the ability and aptitude to infer word meaning and/or grammatical function through morphemes. English derivations such as *boyishly* or *solidarity* are morphosyntactic in nature, conveying syntax through the suffix (e.g., most words that end with *-ly* are adverbs, and most words that end with *-ity* are abstract nouns, as in *purity*, *salinity*, *security*). Furthermore, English words are morphophonemic—the spelling of a word conveys information relating to morphemic meaning and phonological sound, or pronunciation. Because the brain constantly seeks patterns and rule-governed assemblies (Pinker, 1999) children do indeed develop MA, but it is often buried in the recesses of the mind. However, this type of knowledge can become meta-cognitive through instruction (Nagy, 2007). In fact, MA is thought to be a subset of meta-cognition (McBride-Chang, Wagner, Muse, Chow, & Shu, 2005; Nagy, 2007). Until about 1990, MA had been somewhat overlooked in research and particularly in practice, but recent studies have shown it to be strongly related to literacy, including reading, spelling, vocabulary, comprehension, and even grammar (Carlisle, 2003; Nagy, 2007). In describing how the brain processes printed language, Maryanne Wolf stated, “Morphological knowledge is a wonderful dimension of the child’s uncovering of “what’s in a word,” and one of the least exploited aids to fluent comprehension” (2007, p. 130). In summing up her research on morphological awareness, Marcia Henry stated, “The greatest benefit from instructional time spent on word study can be gained from exploring roots, prefixes, suffixes, and networks of related words” (1997).

These materials were developed as I was teaching, to help my middle school intervention literacy class develop greater confidence and competence when faced with complex words composed of multiple affixes or combining forms. The morphemic meanings in the book are not to be memorized by rote so much as applied. These pages supply students with a “safe place” to practice inferring meaning when they encounter unknown words, by combining context clues with morpheme clues. Use these materials to convey effective independent reading habits, and encourage learners to transfer these skills to all aspects of reading and writing. Maintain a positive, lighthearted tone—the goal is not to become linguists, but to become interested in words and aware of patterns (see Ebbers & Denton, 2008).

With *VTM*, students learn to analyze the structure of words and to use context clues to find meaning. In addition, they practice sorting related words by connotation or shades of meaning, creating networks such as *unbending, firm, unchanging, resolute, unequivocal, and rigid*). A major goal of the book is to help students see the patterns in morphological families of words that share a common root (*structure, construct, deconstruct, reconstruction, instructor, etc.*). In addition, *VTM* includes analogies to help thinkers develop logic with word relationships.

Vocabulary through Morphemes enables students to both deepen their present word knowledge and to better understand unknown words encountered in the future. Vocabulary growth should be seen in terms of breadth of knowledge (how many words do you know?) and depth of knowledge (how well do you know the words that you do know?), as described by Bowers & Kirby (2009) and Baumann et al. (2002). Through morphemic analysis in context, known words can become known at a deeper level—students will know not only what the word means, but why it means what it means, or how it got its name, as well as how the context can—and often does—morph the meaning, slanting it or reshaping it a bit.

This book teaches the more common prefixes, suffixes, and roots. The specific Greek, Latin/French, and Anglo-Saxon/Germanic morphemes and their meanings and origins were obtained from a number of sources (e.g., American Heritage Dictionary, 2000; Cornog, 1998; Ehrlich, 1968; Hendricks, 1992; Henry, 2003; Moats, 2000; Nurnberg & Rosenblum, 1989; Oxford English Dictionary, 2002; Stahl, 1999). These morphemes are worthy of instructional time because readers will encounter them repeatedly in varied domains, and because understanding derivational morphology is key to grasping academic content vocabulary, especially in science and social studies (Butler, Bailey, Stevens, Huang, & Lord, 2004). Furthermore, many of the vocabulary selections are taken from the *Academic Word List* (Coxhead, 2000) and thus increase comprehension of the formal language used in lectures, texts and formalized tests.

USAGE: HOW TO USE THESE MATERIALS EFFECTIVELY

Sequence: It is most effective to complete the materials in the order provided. Lessons build upon the previous ones. Students review previously learned content and integrate new concepts into their knowledge stores. This is a sequential and systematic approach to learning the most common morphemes in the English language. First, teach suffixes, then prefixes, and finally roots.

VTM begins with suffixes because derivational suffixes drive the part of speech. English derivations are *morphosyntactic*—syntax is encoded into the suffixes. For example, most words ending with the derivational suffix *-ic* are adjectives, as in *heroic, fantastic* and *exotic*, and most words ending with the derivational suffix *-ate* are verbs, as in *educate, exaggerate*, and *hyperventilate*. Why does this matter? It is not uncommon for students to learn the basic meaning of a word—to get the gist—but to misuse it when speaking or writing. This happens because the student does not have a good grasp of derivational morphology—the student has not learned how a derivational suffix directs the part of speech. Changes in syntax occur when the suffix changes. Thus, *create* is a verb, as are many words that end with the suffix *-ate*, but *creative* is an adjective, as are many words that end with the suffix *-ive*, and

creativity and *creation* are abstract nouns, as are most words that end with the suffix –ity and –ion, regardless of whether it is spelled –tion or –sion. For learners to grasp abstract academic word meanings and become adept at using words correctly when speaking and writing, they must get a sense of the suffix and they must tune their ears to hear “the ring of right” in terms of grammar, syntax, and usage. Note, this is not about memorizing the meanings of the suffixes—the meanings of most suffixes are cumbersome and opaque—rather, the goal is to improve grammar. If students understand syntax fairly well, but yet need to broaden and deepen their vocabulary, move quickly to prefixes.

Prefixes are key to meaning. In many words, the meaning is clearly mapped into the prefix, as in *interior*, *exterior*, *posterior*, *anterior*, and *ulterior*. In many cases, prefixes change the flavor, or connotation, of the word. For example, *deport* is more negative than *support*, and *supermolecule* is more impressive than *molecule*. Furthermore, the prefix is easy to find, because it is always at the beginning of the word—although it becomes tricky when the word has multiple prefixes, as in *insubstantial*. As students learn the prefixes, they will continue to encounter the suffixes they learned in the first section. This provides an opportunity to review suffixes and check for understanding over time. Distributed practice is a key component of this program.

Finally, students master the meaning found in Greek combining forms and Latin roots. Greek and Latin roots are ubiquitous to academic textbooks, beginning in intermediate grades. Greek roots are essential to science words. Most academic words contain a Greek or Latin root, so learning these morphemes should promote academic vocabulary. Previously taught suffixes and prefixes are integrated into the roots section, to ensure a more complete understanding of the word. This allows the student to revisit and rehearse previously learned prefixes and suffixes.

Note, depending on the needs of the students and the time allocated for instruction, these lessons could be truncated and combined. It is not always necessary for every student in every setting to fully explore every table on every instructional page and to complete every practice page. In some settings, for example after school programs and summer school programs, teachers have successfully truncated and combined sections, focusing on the most essential morphological skills, including suffixes and prefixes. For at-risk readers, the Latin and Greek roots are an advanced concept, but understanding the affixes is more immediately essential to literacy.

Pacing and Timing: There are 83 lessons total, plus several assessments. Plan for about 15 minutes a day for about 90 days, depending on the skills and needs of the students. At a fast pace, the whole curriculum could be completed in three quarters of the school year. A more leisurely—and more realistic—approach will take the whole school year, allowing time for field trips, achievement testing, etc. In general, teach one lesson at a time, unless the students are more advanced. Do not teach toward mastery and memorization of each vocabulary word. Rather, provide an understanding of the morphological concept and model the outside-in strategy for integrating context clues and morpheme clues to predict meaning. Then move on to the next lesson. The curriculum is recursive, previously taught concepts will be addressed again, as review. Upon occasion, use flashcards and games to review previously learned affixes and roots. Also, apply morphemic analysis to context frequently when reading any text.

The Instructional Page: Use explicit methods with the instructional page to teach the new morphemic principle. Students must learn the morpheme and its meaning (or grammatical role, for suffixes). Teach the new morpheme, having students read the phrases and sentences aloud, with a different group assigned to read each different column in the table, reading across each row (or read aloud in partners, one column per partner, as illustrated below). Discuss the meaning of the words and sentences, using context and morpheme clues in tandem. Have students highlight the morpheme wherever it occurs on the page, circling the root and underline the affixes. Help students figure out unknown words by combining morpheme clues and context clues. Show them how morphemes and meanings flex with context. Students might maintain a notebook, entering newly learned morphemes dictionary style, along with exemplar words for each morpheme and spoke diagrams, with the root in the center and exemplars radiating outward. The instructional page should take about 15 minutes.

Latin suffix -ary

TABLE 1

<i>EXAMPLE</i>	<i>MEANING</i>	<i>PHRASE</i>
granary	“a place for grain”	farmers filling the granary
statuary	“a collection of statues”	a group of statues in that statuary
library	“a place for books”	numerous books at the library
dictionary	“a place for words”	multiple words in the dictionary
glossary	“a collection of terms”	a glossary at the back of the textbook
apiary	“a place for bees”	an apiary filled with buzzing bees
topiary	“a collection of sculpted shrubs”	animal-shaped shrubs at the topiary

Read across each row. Partner/Group A reads column 1 aloud.

Partner/Group B reads column 2 aloud.

Everyone reads column 3 together aloud.

The Practice Page: After learning the new morpheme on the instructional page, students complete the associated practice page(s). Explain the instructions and complete a few samples together, modeling and using think-aloud methods to make the cognitive processing transparent. Then, allow students to complete the page alone, in partners, as homework, or at the beginning of class the next day. Have a dictionary available for reference. Discuss the answers together, providing immediate and explicit feedback. The practice page should take 5-10 minutes, with some exceptions.

Reviews and Assessments: Most of the practice pages review concepts learned in prior lessons. In addition, several assessments are provided. Use these tools to monitor student learning and plan future lessons. Provide immediate and explicit feedback upon completion of the tests. Also, look for increasing use of morphemic analysis in context during content-area reading. This indicates increasing levels of proficiency.

WHY STUDY MORPHOLOGY: THE RESEARCH BASE

Morphological awareness (MA) appears to become more important as students get older and texts become dense with morphologically complex words. Primary-grade textbooks contain fewer such words than do intermediate and secondary texts (Ebbers, 2008; Nagy & Anderson, 1984). Seemingly in tandem with the texts themselves, MA develops over time. In second grade it accounts for only 15% of the variance in vocabulary (McBride-Chang et al., 2005) and by fifth grade, for perhaps as much as 53% (Carlisle, 2000). By fifth grade, MA predicts reading proficiency more than PA (Mann & Singson, 2003).

The literature confirms that MA is related to reading proficiency for varied populations, including typical and diverse learners (Henry, 1997; Kieffer & Lesaux, 2008; Nagy, Berninger, & Abbott, 2006). Understanding word structure is effective for English language learners (Carlo et al., 2003; Kieffer & Lesaux, 2008). Second language learners and native speakers of English in fifth grade have demonstrated enthusiasm for exploring morphological relationships, including cognates that share the same root (Carlo et al., 2004). With respect to students with dyslexia, Deacon, Parrila, & Kirby (2008) recently analyzed the pertinent literature base and concluded, “Morphology may provide a compensatory avenue of instruction for dyslexics and poor readers, and may be the means by which some individuals have overcome dyslexia” (abstract). With respect to reading disabilities, the experimental evidence is promising yet unclear, with effect sizes ranging from – 0.93 to 9.13 (Reed, 2008). Even more recently, Bowers, Kirby and Deacon (in press) conducted a meta-analysis of intervention studies involving morphology instruction. They found significant effect of MA instruction on literacy with strongest effects for morphological sub-lexical outcomes involving affixes and roots ($d = 0.65, 0.51$) and stronger effects for control group versus alternative treatments. They concluded that integrating alternative treatments, such as PA, with MA, may be effective.

Readers of high and low proficiency use morphological cues to help them decode words (Abbott & Berninger, 1999; Carlisle & Stone, 2005; Singson, Mahony, & Mann, 2000). Further, MA is

correlated with vocabulary and with comprehension (Carlisle, 2000; Kieffer & Lesaux, 2008; Ku & Anderson, 2003). For example, Nagy et al. (2006) found that MA was highly correlated with vocabulary knowledge ($r = .83$) for typical fourth and fifth grade readers, even when phonological processing/awareness was factored out of the equation, and they also found that MA explained about 40% of the variance in comprehension in grades 4-9, after accounting for the usual suspects, including vocabulary knowledge. Morphological awareness contributes to comprehension, in part because the derivational suffix drives the syntax and because a derivation tends to convey nuance.

In short, when students develop MA, including structural analysis skills, they more adequately decode and comprehend complex words (Abbott & Berninger, 1999; Bowers & Kirby, 2009; Bowers, Kirby, & Deacon, in press; Carlisle & Stone, 2005; Kieffer & Lesaux, 2008; Ku & Anderson, 2003; Nagy et al., 2006; Nunes et al., 2003; White et al., 1989). Furthermore, by teaching strategies for attacking words in context, teachers promote independence in reading (Baumann et al., 2003, 2002; Tomesen & Aarnoutse, 1998). The ability to read independently is one of the supra-ordinate goals of literacy instruction. These general findings are elaborated upon in the sections below.

Evidence for When Learners Grasp Word Structure: Inflections, Compound Words, and Derivations

Regular *inflections* are words that end with inflectional suffixes (*-s/-es, -ed/-ing, -er/-est*). These suffixes do not change the word's class of grammatical function (e.g., *bright* is an adjective, and so are *brighter* and *brightest*). By first or second grade, most typically developing English-speaking children have grasped how inflectional suffixes work, at least in oral language (Gardner, 2007). However, individual differences with inflectional morphology exist, especially for diverse learners; some English Language Learners and students with special needs manifest difficulty with inflectional suffixes *-s, -ed, -ing, -er,* and *-est*. (Windsor, Scott, & Street, 2000).

Compound words are created when two or more lexemes are combined, but not necessarily connected, as in *rainbow, polar bear, son-in-law*. The ability to infer meaning from compound words depends largely on the degree to which the meaning is figurative (*bulldozer*) or literal (*dollhouse*) and the degree to which the phonology shifts (e.g., a phonological shift occurs in *breakfast* and *cupboard*). Linguistic insight with respect to compound words varies in second graders with the least proficient readers demonstrating the least understanding of compound word structure (McBride-Chang et al., 2005; Nagy, Berninger, Abbott, Vaughan, & Vermeulen, 2003).

Derivations and derivational suffixes generally present the greatest challenge (Anglin, 1993; Gardner, 2007). Unlike inflectional suffixes, derivational suffixes convey syntactic information regarding grammatical function, as seen in the transformations from *create* to *creative* and *creatively*. In addition, derivational suffixes may convey strong semantic information, as in *painful, painless* or weak semantic information, as in *politic, political*. Accelerated growth in derivational morphology occurs after third grade and continues through high school (Anglin, 1993; Mahony, 1994; Nagy, Diakidoy, & Anderson, 1993). In his monograph, Anglin (1993) described noticeable growth between third and fifth grade in sensitivity to derivations, with little evidence of understanding in first grade. This pattern is fairly consistent, but a few derivational affixes are assimilated in early childhood. For example,

Bowerman (1982) and Clark and Cohen (1984) have described toddlers who create words with the derivational agentive suffix *-er* in *teacher*, the derivational suffix *-y* in *rusty*, and the prefix *un-* in *untie*. Such highly productive affixes are heard frequently and thus learned first.

Because intermediate and secondary content area texts have an abundance of derivations (e.g., a 5th grade text analysis by Butler et al., 2004; Nagy & Anderson, 1984), a lack of understanding of how derivational suffixes drive word class (syntax or grammar) and how derivations create abstract meanings becomes essential (Carlisle, 2007; Nagy, 2007). A poor grasp of derivational suffixes has been identified in struggling readers in middle and high school and in college (Mahony, 1994; Nagy et al., 2006).

Evidence for Teaching Morphological Word Families

It is important to reveal how words relate to one another in morphological families (*part, partial, partition, partly, etc.*). Nagy and Anderson (1984) estimated that school texts contain 88,500 distinct words, each word having related forms whose meanings might be inferred through morphemic and contextual analysis. Nagy, Anderson, Schommer, Scott, and Stallman (1989) demonstrated that adults recognize words more quickly if they belong to a morphological family, concluding that words are activated in the mental lexicon through morphemic relationships, not as separate entities. In clinical trials, Dorfman (1998) found that morphemic chunks prompted recognition significantly more than did syllabic chunks; she interpreted the results vis-à-vis implicit memory, word learning, storage, and retrieval. In a computer simulation study, Reichle and Perfetti (2003) (2003) examined the effect of morpheme frequency in a word identification model. Prompted by an encoded base word—to the computer, just a string of letters—the simulator more efficiently processed the word’s pronunciation and meaning when it could find five derivations related to the target word, but not when it could find only one related derivation, despite the fact that the single derivation had the same frequency as the sum of the five (see also Bertram, Baayen, & Schreuder, 2000). Building on these findings, Carlisle and Katz (2006) studied the effects of word family frequency in weak and strong readers in fourth and sixth grade. Strong readers benefited most from family effects, but even weak readers generally read words faster and more accurately if they belonged to a large family. Again, degrees of transparency facilitated processing. Carlisle and Katz concluded, “The larger the family size, the more likely students activate the morphological constituents in the process of word reading” (p. 687).

Morphology Instruction: Evidence of Effectiveness

Readers who are more aware of morphemes should more readily comprehend academic texts, because advanced texts contain an abundance of morphologically complex words (Nagy & Anderson, 1984). If MA is not well developed, instruction is necessary. As educational linguist Bill Nagy recently asserted, “...vocabulary instruction needs to be more explicitly metalinguistic—that is, word consciousness is an obligatory, not an optional, component” (2007, p. 54). The most recent reviews of the literature lead us to believe that instruction in morphological awareness may be especially important for readers striving to overcome dyslexia and other reading difficulties (Deacon, Parrila, & Kirby, 2008; Reed, 2008). A recent meta-analytic examination of the corpus of intervention studies that targeted MA revealed significant effect of MA instruction on literacy with strongest effects for morphological sub-

lexical outcomes involving affixes and roots ($d = 0.65, 0.51$). Most surprising, the research team concluded that teaching MA in the primary and early elementary grades is as effective as in intermediate and secondary grades (Bowers, Kirby, & Deacon, in press).

Experimental Studies of Morphological Awareness

Facility with morphology correlates with literacy in the early years of elementary school and predicts literacy in latter years. Deacon and Kirby (2004) demonstrated that awareness of inflectional suffixes measured in second grade predicted reading comprehension in fifth grade, despite differences in PA and reading comprehension in second grade. Carlisle (1995) found that morphological production of compound words measured in first grade predicted word recognition and reading comprehension in second grade. Her study illuminated the strong relationship between morphology and phonology in the primary grades. More recently, Nagy et al. (2003) learned that at-risk second graders ($N = 98$) virtually failed to comprehend novel compound words. For example, they had difficulty deciding that *bee grass* was a better choice than *grass bee* for naming the grass where bees like to hide. They also scored very poorly when asked whether or not word pairs such as *moth-mother* and *quick-quickly* were related. Nagy and his colleagues determined that MA made a direct and unique contribution to reading comprehension, despite shared covariance with phonological and orthographic awareness and oral vocabulary. McBride-Chang et al. (2005) measured awareness of inflectional and compound morphology in 220 English-speaking students. Controlling for PA, phonological processing, reading, age, etc., they determined that awareness of inflections and compounds uniquely predicted vocabulary in kindergarteners ($R^2 = .08$), and even more so in second graders ($R^2 = .15$). Carlisle (2000) found that MA explained about 40% of the vocabulary variance in 4th grade and about 50% of the vocabulary variance in fifth grade; however, she did not control for PA, and she included derivational understanding in her study.

Studies involving prefixes

Understanding prefixes contributes to word knowledge. In his review of the scientific literature on prefix instruction, Graves (2004) concluded that intermediate and secondary students can be effectively taught to use their knowledge of prefixes to infer the meanings of unknown words. In a frequently cited quasi-experimental study, students in third grade learned the nine most common prefixes and morphemic analysis strategies and outperformed a comparison group on several measures of word knowledge (White, Sowell, & Yanagihara, 1989).

Studies involving derivational suffixes

Carlisle (2000) found that MA accounted for 41% of the vocabulary variance in third graders and 53% in fifth graders. Carlisle and Stone (2005) demonstrated that third graders read bimorphemic derivations (*robber, beggar*) faster and more accurately than did second graders, but that all students generally read words constructed of base and suffix, such as *shady*, more fluently than they read two-syllable words similar in spelling but having only one morpheme, such as *lady*. They concluded that second- and third-grade students likely accessed morphemes to read words.

In a multidimensional endeavor, Nunes, Bryant, and Olsson (2003) studied children from a range of socioeconomic backgrounds in London, randomly assigning 222 students to 1 of 4 treatment groups and 246 students to the control group. The mean age was 8 years and the intervention was provided weekly, 12 times. Using oral-language methodology in small groups, children received either PA or MA treatment—with or without a corresponding writing element, where spoken words were also printed. The standardized reading assessment—decoding increasingly long and unfamiliar words—yielded significant group effect, $F(4, 394) = 6.46, p < .001$. In addition, each separate treatment resulted in reading gains: The PA only (no writing) group significantly outperformed the control ($p < .001$), and the three other treatments were also superior ($p < .01$). In reading morphologically constructed pseudowords, both MA groups outperformed the control ($p < .05$), as did the PA with writing group ($p < .001$). With respect to the spelling tests, hypothesized growth in morphemic encoding was not realized through PA, but both MA treatments resulted in significant improvement over the control.

Nunes, Bryant, and Bindman (2006) investigated MA and spelling in 530 children of varied backgrounds from London and Oxford. In the smaller second-half of the study ($N = 167$, mean age 8 years), results indicated that children's spelling of morphemes significantly predicted their ability to define morphological pseudowords, even after controlling for age and IQ. Thus, learning to spell with morphemes influences morphemic reading. With regard to spelling, Kemp (2006) tested middle-class British children in grades 1-4 to determine if and when they use morphological knowledge to spell inflected and derived words, finding that the older and/or better spellers utilized morpheme clues more readily, but even first graders manifested MA when spelling, albeit inconsistently.

Investigating morphological awareness in grades 4 and 5, Bowers and Kirby (2009) conducted a 20-session random-assignment experimental intervention targeting morphemic word structure on vocabulary knowledge. They reported significant instructional effects on morphological analysis and vocabulary with words that were taught directly and novel words built on bases that were taught in the context of other derivations, but not for words with untaught bases. This study illuminates the importance of teaching, and learning, common affixes, and applying the meaning and/or usage of the affix to a root or base.

In explaining the success of their intervention, Bowers and Kirby (2009) theorized that some of the benefits of instruction in MA result from the rising realization that there are often meaningful links to look for within words and across words. This emerging realization could be called a “root awakening” (Ebbers & Denton, 2008) and is related to self-efficacy. As Carlisle stated, “It is only when students believe they know how to analyze unfamiliar words in texts that they will expend the energy to become close readers” (2007, p. 99). Developing self-efficacy with complex words is necessary, given the fact that intermediate and secondary texts contain a high percentage of unknown words, many of which are composed of a root and a derivational suffix (Butler et al., 2004; Nagy & Anderson, 1984).

Evidence for Teaching a Meaning-Making Strategy Combining Context Clues and Morpheme Clues

It is impossible to directly teach all the words that students need to learn. Readers must learn how to “figure out” what an unknown word might mean when reading independently. Through

instruction, readers can be taught to infer meaning by analyzing the context clues and the morpheme clues, preferably in tandem (Baumann, Edwards, Boland, Olejnik, & Kame'enui, 2003; Baumann et al., 2002; Tomesen & Aarnoutse, 1998; Wysocki & Jenkins, 1987). Morphemic analysis refers to the process of parsing word parts to infer meanings of unknown words. A *morpheme* is the smallest unit of language that carries meaning. In the word *biographers*, there are four morphemes: *bio*, *graph*, *-er*, *-s*. Because about 60% of the word meanings in printed school English in grades 3-9 might be predicted through their morphemes and through context clues (Nagy & Anderson, 1984), strategies in morphemic analysis have strong potential for enhancing the reading and vocabulary development for all readers, including those with reading difficulties. Nagy et al. (1989) found that knowing just one word from a morphological family can help the adult reader infer the meaning of a related unknown word.

The use of context to infer the meanings of unknown words is more reliable when readers analyze both the context surrounding the word and the morphemes within the word (Wysocki & Jenkins, 1987). Wysocki and Jenkins found that middle school students who were able to use both morphemic clues and context clues as *separate* strategies did not necessarily *combine* the two when approaching an unknown word during reading. They needed to be taught how to do so.

Typically progressing students profit from explicit instruction in strategically analyzing contextual and morphemic clues in tandem (Baumann et al., 2003, 2002). Examining the effectiveness of contextualized morphemic analysis, Baumann and his colleagues (2002) conducted research with four groups of typically achieving fifth-graders. One group received instruction in prefixes, another received instruction in context clues, a third group received instruction in combining both prefix clues and context clues, and the last group served as an instructed control group. In general, the students who received instruction in morphology, either combined with context or taught separately, outperformed the control group in vocabulary knowledge. In a similar follow-up study, Baumann et al. (2003), found that fifth-grade students could be taught to successfully use morphemic analysis with context clues in the context of their social studies text. In this study, one group of students was directly taught textbook vocabulary, while another was taught the meanings of common morphemes, and how to apply the combined morphemic and context clue strategy. As might be expected, the directly instructed group performed better on a test of the taught words, while the morphemic analysis group demonstrated a greater ability to determine the meanings of untaught words that contained the morphemes they had learned. On a test given immediately after the intervention concluded, there were no differences between the groups in their abilities to infer the meanings of unknown words presented in text with useful context clues, but in a second test given three weeks later, the morphemic analysis group performed significantly better than the directly instructed group. Thus, both studies conducted by Baumann et al. point to potential value in teaching students to analyze morphemic and contextual clues, although results were somewhat mixed and neither found gains in passage comprehension.

Teaching morphemic analysis in context as an independent word learning strategy has been found to be effective for struggling readers, but the research corpus is slim and inconclusive. For example, Tomesen and Aarnoutse (1998) investigated such an approach with both average and low functioning fourth- grade readers in the Netherlands. Using an instructional plan including the principles of direct instruction and reciprocal teaching, these researchers found significant positive effects in the

ability of the students to derive word meanings from morphemic clues in tandem with context clues. Most interesting, they found that the lower performing readers in their sample benefited the most from this intervention. Nevertheless, additional research pertaining to this word-learning strategy is clearly needed, particularly with older struggling readers.

In sum, when students develop MA they more adequately decode and comprehend complex words (Abbott & Berninger, 1999; Bowers & Kirby, 2009; Carlisle & Stone, 2005; Kieffer & Lesaux, 2008; Ku & Anderson, 2003; Mann & Singson, 2003; Nagy et al., 2006; Nunes et al., 2003; White et al., 1989). By teaching strategies for attacking words in context, teachers promote independence in reading (Baumann et al., 2003, 2002; Tomesen & Aarnoutse, 1998). This is arguably one of the ultimate goals of reading instruction.

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