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Morphological Analysis Training for English Language Learners With Reading Difficulties

A Dissertation submitted in partial satisfaction of the requirements for the degree of

Doctor of Philosophy

in

Education

by

Sean Jeremy Davidson

March 2014

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Committee Chairperson

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Dedication

I dedicate this work to my incredible family. To my dear wife, Sylvia Poareo, and children, Sean Lucas, Mayela, and Sabriel, thank you for your support, patience, and encouragement throughout this journey. I was able to bring this work to fruition because of you. I am truly grateful for all that you have done. To my parents, Dwight and Cheryl Davidson, thank you for all of your support and encouragement.

Thank you to my advisor, Dr. Rollanda O’Connor. Your guidance, encouragement, targeted questioning, and advice have enabled me to develop into a better writer and researcher. You exemplify the role of a graduate advisor.

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Finally, to Dr. Anita Archer, I am so grateful for your support, mentoring, and encouragement throughout these years.
ABSTRACT OF THE DISSERTATION

Morphological Analysis Training for English Language Learners With Reading Difficulties

by

Sean Jeremy Davidson

Doctor of Philosophy, Graduate Program in Education
University of California, Riverside, March 2014
Dr. Rollanda O’Connor, Chairperson

English language learners (ELLs) represent one of the fastest growing student populations in the United States, and they experience reading difficulties and increased risk for Special Education identification compared to English-only speaking students (EOs). Lack of vocabulary knowledge is a contributing factor for reading difficulties. An immense gap in vocabulary knowledge exists between EOs and ELLs, making it difficult to directly teach the necessary amount of words to close this vocabulary knowledge gap. One promising approach to address this issue is to teach students to analyze words into their constituent morphemes (meaningful units of a word) in order to determine the meaning of words. If ELLs can be taught to use this strategy to derive meanings of unknown words while reading, they can take advantage of self-teaching opportunities to increase their vocabulary knowledge. This study investigated whether (a) ELLs at risk for reading difficulties could be taught a morphological analysis strategy to determine the meanings of words; (b) ELLs of differing reading profiles would
respond similarly to the intervention; and (c) participants could generalize learning to novel words. Nine fourth and fifth grade ELLs with reading difficulties from a low socio-economic school participated in this study. The study employed a multiple baseline, single-case design. Visual analysis of the results established a functional relation between the intervention and an increase in students’ vocabulary scores. In addition, the percentage of nonoverlapping data ranged from 90% to 100% for eight students. Moreover, students were able to generalize this learning to untaught words. These findings suggest that ELLs should receive targeted instruction in the morphological analysis to increase their vocabulary knowledge.
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Chapter 1: Introduction

Comprehension of text is critical for academic success. Yet many students experience difficulties with comprehension, especially English language learners (ELLs). ELLs represent one of the fastest growing demographics in the United States. The percentage of students who speak a language other than English at home rose from 10% to 21% from 1980 to 2009. The percentage of children who spoke another language at home who also spoke English with difficulty was 24% in 2009 (U.S. Department of Education, 2011). Also ELLs tend to be less proficient in reading than English only students (EOs) on national assessments of reading in 4th grade. According to the National Assessment of Educational Progress Report (National Center for Education Statistics, 2011) only 30% of ELLs scored at or above basic, and only 7% scored at or above proficient. These percentages are much lower than English-only students (EOs), of which 70% scored at or above basic and 35% scored at or above proficient. For ELLs in California, 28% scored at or above basic and only 5% scored at or above proficient. For EOs, 70% scored at or above basic and 33% scored at or above proficient. Thus, there is a need to find ways to increase the reading achievement of ELLs. One particularly difficult aspect of reading for ELLs is understanding vocabulary words in English. The NAEP report indicates a high correlation between achievement on vocabulary assessments and comprehension (National Center for Education Statistics, 2012). According to the report, students who scored high on the vocabulary assessment also tended to score high on the reading assessment. Unfortunately, ELLs scored more poorly on both comprehension and vocabulary.
The reading difficulties of ELL lead to multiple negative outcomes. Studies indicate that ELLS are at higher risk for identification of special education services, particularly in high-incidence categories such as Specific Learning Disabilities (Sullivan, 2011). ELLs are more likely to experience increased drop out rates and grade retention (Bowman-Perrot, Herrera, & Murray, 2010). Thus, there is a pressing need to identify effective interventions to close the comprehension gap for ELLs and to mitigate its adverse consequences on academic achievement.

**Factors Contributing to Comprehension**

To consider how such interventions could be identified or developed, I begin with a review of the literature on some of the known specific components of reading comprehension. In this review I concentrate on aspects of reading comprehension that respond well to intervention for EOs.

**Relationship between vocabulary and comprehension.** Research has shown that vocabulary knowledge is a strong predictor of reading comprehension ability (Hargrave & Senechal, 2000; Perfetti, Wlotko, & Hart, 2005; McKeown, Beck, Omanson, & Pople, 1985; Snow, Tabors & Dickinson, 2001). For older, good readers, listening comprehension and reading comprehension are roughly equivalent (Nippold, 1998). According to the simple view of reading (Gough & Tunmer, 1986; Hoover & Gough, 1990), reading comprehension is the product of word reading and oral language. Thus, in addition to facility in reading words, students must also possess strong oral language, of which vocabulary is integral. As students progress into the upper elementary grades, they add many root words. Yet, there are differences between high
achieving and low achieving students. Although students of differing achievement levels make similar rates of growth, the gap that existed when students began school rarely diminishes (Biemiller & Slonim, 2001). Thus, a need exists to identify methods for assisting struggling students in closing the vocabulary knowledge gap.

In Nagy and Townsend’s (2012) review of research, the authors argue that academic vocabulary (AV) is a vital “tool” necessary for increased academic achievement. Academic vocabulary consists of words necessary for learning from text, and these words are found in expository text materials more often than in daily conversation. AV is characterized by words of Greek and Latin origin and is morphologically complex. Morphologically complex words contain more than one morpheme. A morpheme is the smallest unit of meaning in a word. For example, bed contains one morpheme and is not morphologically complex whereas justify contains two morphemes (the adjective just with the suffix –ify, which changes an adjective to a verb) and is morphologically complex. Without AV, students will have difficulty comprehending grade level texts, especially in the upper elementary grades, as well as difficulty with understanding and discussing the concepts of content areas, which are vital to academic success.

With the adoption of Common Core State Standards (CCSS, 2012), AV will play a prominent role in language arts curriculum. The standards require students to read more expository text, which contain more morphologically complex words. The standards themselves also call for students to “determine the meaning of general academic and domain-specific words and phrases in a text relevant” to grade level
appropriate texts (CCSS, p. 14). In order to be successful, students need to build their AV as well as possess the tools for deriving word meanings from morphemes.

Nunes and Bryant (2011) suggest teachers should explicitly teach morphemes, of which many academic words are composed, to develop word reading and vocabulary. Morphologically complex AV also corresponds to McKeown and Beck’s (2011) notion of Tier 2 and Tier 3 words, which they argue should be the target of instruction and which are also an area of need for English language learners (Orosco & O’Connor, 2011). Both ELLs and students from low socioeconomic families benefit from vocabulary development (Kieffer, 2008).

**Relationship between word reading and comprehension.** A second challenge that older students encounter is the increased amount multisyllabic, morphologically complex words in texts. The ability to read multisyllabic words effortlessly is a particular challenge for students with reading difficulties (Rack et al., 1992; Shefelbine, 1990; Spear-Swerling and Sternberg, 1994). Nagy, Anderson, Schommer, Scott, and Stallman (1989) suggested knowledge of how word forms combine and morphemic awareness (MA) could enhance decoding and understanding of unknown words, and may make a direct contribution to comprehension and an indirect contribution via word reading and vocabulary.

In addition, although older struggling readers may have learned the basic sounds for consonants and vowels, they have not solidified this knowledge to read novel words. They do not attend to all of the letters within a word; they make guesses at words that look similar to words they already know and are stuck in the partial alphabetic stage of
word reading (Ehri and McCormick, 1998). Without attending to all of the letter-patterns within words (including morphemes), students will not accurately read words by making analogies between words known and new words encountered (Ehri and Robbins, 1992; McCandliss, Beck, Sandak, & Perfetti, 2003), which denies them the self-teaching mechanisms that good readers use in order to learn how to read novel words (Share, 1995). When struggling readers encounter morphologically complex words and they do not know how to decode them, they miss out on this self-teaching opportunity, both for word reading and vocabulary development. If students cannot read the words, they cannot infer their meanings.

**Summary.** Reading comprehension is the ultimate goal of reading instruction, and ELLs experience comprehension difficulties with text written in English. In order to comprehend text, students must be able to read the words and know what these words mean. As students progress into the upper grades, words encountered in text become more complex morphologically, and therefore need to develop morphological awareness.

**Chapter 2: Review of the Literature**

**Morphological Awareness**

In order to read, children need linguistic awareness, which enables children to learn how oral language is represented in a language’s orthography, resulting in a deeper understanding of language forms and functions (Carlisle, 2003). It has been argued that, because English orthography is morphophonemic, morphological awareness is important for word reading and comprehension (Carlisle, 2000; Henry, 1988, 1989, 1993). English is characterized as morphophonemic because English orthography represents both sounds
(letter-sound correspondence) and morphemes. Morphemes are units of meaning and can be bound or free. Base/root words and affixes are morphemes. Affixes include both prefixes and suffixes. Suffixes can be classified as inflections (changing the grammatical function but not the class of a word) or derivations (altering the meaning of the word and often changing its class).

Three aspects of morphologically complex words affect morphological awareness (Carlisle, 2003). First, frequency of morphologically complex words may affect how they are stored in the mental lexicon. High frequency words may be stored as whole words, as a single morpheme, whereas low frequency words may be accessed through decomposition of the word, breaking a morphologically complex word into its morphological components, then synthesizing these components to determine the word’s meaning. For example, one may recognize the morphemes of justify, just and -ify. Then, after recalling the meaning of the morphemes (just means right and ify makes an adjective into a verb), one can then put the two morphemes together to determine the word’s meaning, to make right. Second, transparency of suffixes also affects MA. Transparency refers to the combination of phonology, orthography, and semantics. When a morphological relationship is transparent, it is easy to see the relation between the morphological components. For example, the morphological relationship in the word singer is transparent; the word sing does not undergo phonological or orthographic changes when the suffix -er is added, and the meaning is clear (someone who sings). When the relationship is not clear, it is referred to as opaque. For example, preside undergoes a phonological shift when the suffix -ent is added to form the word president.
Third, productivity (morphemes that produce consistent meanings and are of high frequency such as –er in runner) affects MA. With MA, individuals are able to see the relationship between the morphological components in words and use them to read and understand words. Carlisle argues that phonology is an important part of morphology because phonology can help students with initial recognition of morphemes; however, MA is not exclusively phonological because it includes orthographic, syntactic, and semantic properties, as well. Because the orthographic, phonological, and semantic properties of morphemes are within the grasp of elementary school-age children, Carlisle argues that morphological instruction should not be withheld until middle school; children can develop an awareness and begin to attend to theses structures, resulting in self-teaching opportunities (Share, 1995).

Summary. Morphemes are the smallest unit of meaning within a word. Morphological awareness (MA) is the ability to recognize these units of meaning and understand that some words are made up of more than one morpheme. In addition, MA entails the ability to determine that some words consist of more than one morpheme and that words that share morphological elements are semantically related, thereby having a strategy for determining the meaning of unknown words. How do students acquire morphological awareness?

Acquisition of Morphological Awareness

Berko (1958) demonstrated that young children could infer basic morphological rules. Berko administered an assessment to preschool and first grade children that required them to produce an inflected/derived form of a nonsense word (e.g. the plural of
wug\(^1\) = wugs\(^*\), the past tense of rick\(^*\) = ricked\(^*\). Results showed that young children have begun to internalize morphological rules. However, this knowledge of morphological rules is incomplete, as evidenced by difficulties with contingent formations of plurals and past tense (e.g. tass\(^*\) = tasses\(^*\) and mot = motted, respectively) as well as difficulties with possessive nouns, comparatives and superlative adjectives, and compound words.

Tyler and Nagy (1989) examined the acquisition of derivational morphology of fourth, sixth, and eight grade students. They noted three aspects of morphological knowledge: relational, syntactic, and distributional. Relational knowledge describes the ability to recognize two words are related. For example, recognizing that just and justify are related. Syntactic knowledge refers to knowing the grammatical function of the suffix (e.g., -ify changes a noun into a verb). Distributional knowledge refers to understanding the constraints for which conditions suffixes can attach (e.g., -ify attaches to adjectives). In addition, there may be differences between the type of suffix: neutral and nonneutral. Neutral suffixes might be acquired first because they attach to independent words, do not change vowel quality or stress, meanings are transparent, apply to a wide range of words, and are more frequent. For example, -ify attaches to a whole word (just), the relationship of the meanings of just and justify is transparent, and does not alter the pronunciation or stress of just. Nonneutral suffixes attach to bound morphemes (e.g., quant* in quantity), alter stress and/or vowel quality, have restricted applicability, are less transparent in meaning, and are less frequent (e.g., -ure added to

\(^1\) * indicates a nonword.
expose alters the pronunciation of the base word in exposure). With regard to relational knowledge, results suggest that students at 4th grade have already acquired knowledge of both neutral and nonneutral derivational suffixes. For syntactic knowledge, the study found no difference between neutral and nonneutral derivational suffixes and a developmental trend through eighth grade. Syntactic knowledge contributes significantly to reading. Distributional knowledge results, which evidenced overgeneralization of neutral suffixes through a U-shaped curve, suggest that students learn neutral derivational suffixes through combinatory rules while nonneutral suffixes may be learned through analogy. Thus, acquisition of derivational morphology may depend on knowledge of the type of suffix.

Berninger, Abbott, Nagy, and Carlisle (2010) examined the growth trajectory of morphological awareness for students in grades one through six. The researchers found that morphological awareness begins to develop in the early grades, with steeper growth in the first three years. However, compared with other metalinguistic skills, such as phonological awareness, MA continued to develop through 6th grade, leading the authors to speculate that it may develop over a lifetime. Of note for this study, MA was significantly related to vocabulary knowledge for two measures, a decomposition task and “comes from” task. For two other MA tasks, both of which required students to make judgments about appropriate use of words with derivational suffixes, vocabulary was not significantly related. Thus, the authors suggest that MA is important for vocabulary, but insufficient. Students require specific knowledge of how derivational suffixes affect both the syntactic role and meaning of a word.
Rabin and Deacon (2008) explored the lexical representation of morphologically complex words. Do inflected and derived forms differ in their representation? Are there developmental changes? Students in grades one through five were administered a priming task, in which students were first shown either a root word, derived form, or unrelated word with a similar orthographic pattern, or shown a control word with no priming. Students completed a word fragment (e.g. n _ _ d, for need). Words were controlled for frequency, transparency of inflected and derived forms (only suffixes), as well as same root form. Results showed that students were most successful on identity primes, and faster with inflectional and derived forms than with control words, with no significant differences between inflectional and derived forms in priming rates. There was also gradual improvement between students in grades four and five, and students in grades one, two, and three, with no interaction between grade and condition. Findings lend support to a theory that lexicons are organized around morphological principles. That no differences between inflectional and derived forms were found may lie in the nature of the task or items.

Rabin and Deacon suggest that their findings support a model proposed by Schreuder and Baayen (1995), in which children find correspondences among phonology, orthography, and semantics upon which they build morphological representations. This model contrasts with Carlisle and Flemings (2003), who suggested that children search for first for phonological and/or orthographic patterns, and then search for meaning on which to attach.
Summary. Children begin to acquire MA at an early age. There also appears to be developmental stages in acquisition for typically developing readers, with inflectional suffixes acquired before derivational suffixes. Although students begin to acquire MA even before they enter school, growth continues to occur. One source of acquisition is frequent encounters with morphologically complex words through reading during which students store orthographic, semantic, and phonological properties of words. Unfortunately, students who struggle with reading are deprived of these learning opportunities. Differences may exist between children in MA, but is MA related to reading development?

Relationship between Morphological Awareness and Reading Development

Studies have been conducted with regard to when children acquire MA. A more pertinent question for this study is its role in reading development. How might MA affect reading development? Does MA contribute to word reading, vocabulary, and/or comprehension? Is this contribution direct or indirect? What is the contribution of MA above and beyond other early reading skills, such as phonemic awareness (PA) and decoding?

Morphological awareness and early elementary students. In an early study of MA’s contribution to reading development, Brittain (1970) explored the relationship between performance on words with inflectional endings and reading achievement for first and second grade students. Because children enter school with an incomplete mastery of English morphology, Brittain wondered whether a relationship could be found
between children’s inflectional performance and reading achievement, and if so, whether this relationship changed between first and second grade.

Participants included first and second grade native English speaking children from a predominantly middle class neighborhood. Adapting Berko’s measure, students were given an inflectional production task using nonwords to demonstrate singular, plural, and possessive forms of nouns, progressive and past tense of verbs, and comparative and superlative of adjectives. Findings did not indicate significant differences on performance between grades or sex. Findings supported developmental progress from simple to complex forms based on the proportion of correct responses by category. Results indicated a significant relationship between inflectional performance and literacy achievement (a composite of word recognition, word attack, and comprehension) when controlling for intelligence. The relationship was stronger for second than first grade students, suggesting that MA plays a stronger role in reading development as students age.

Carlisle and Nomanbhoy (1993) examined the roles of PA and MA in word reading for first grade, EO students. To assess MA, students had to determine whether two words were semantically related and produce a correct derived form of a word. PA, vocabulary, and word reading were also assessed. With regard to contribution to word reading, they found that both MA and PA made significant contributions, with PA being stronger (33.6% of the variance) than MA (about 4% of the variance). Thus, for young children, although not as strong, MA makes an independent contribution to word reading along with PA.
Carlisle and Fleming (2003) investigated children’s lexical analysis of complex words based on a model proposed by Schreuder and Baayan (1995). In this model, individuals first detect patterns of morphological elements, creating a representation for the morpheme. Then, through subsequent encounters, semantic and syntactic information is stored. Carlisle and Fleming sought to determine if first and third grade students detect and store morphological patterns and then add semantic and syntactic information to this stored representation and whether their performance on morphological analysis was related to morphological processing two years later. They also investigated whether performance on morphological analysis predicted performance on reading comprehension and vocabulary.

Students were recruited from a private school in a Chicago suburb and were native English speakers. Students were given a word analysis test (WAT; Is there a little word in ____ that means something like ____?) and a definition assessment, based on Anglin (1993), which included an interview format to determine students’ vocabulary knowledge. Three of the words from this measure (Definition) were analyzed to determine students’ ability to identify the words’ morpheme and correctly define and/or use the word in a sentence. Two years later, students were given a morphological relational knowledge measure, which measures students’ ability to produce (e.g., Farm. My uncle is a _____.) and decompose (e.g., Driver. Children are too young to _____.) derived words. To measure reading achievement, the Gates-MacGinitie vocabulary and reading comprehension subtests were administered.
Overall, results demonstrated that third graders were significantly higher on the word analysis (WAT) and definition tasks than first grade students. Third graders were significantly more likely than first grade students to decompose words and use them correctly in a sentence. With regard to the relationship between the ability to recognize morphemes within a word and to produce and decompose derived words two years later, results indicated, for the younger students, WAT was significantly related to the morphological production task, but not the decomposition task. For older students, WAT was not significantly related to either. The Definition task, which measured identifying the base word and determining the words meaning, was significantly related to both morphological tasks. Finally, for the younger participants, the definition task accounted for significant variance in reading comprehension. For the older participants, the definition task accounted for significant variance for both vocabulary and comprehension.

These results suggest that third grade students were better than first graders in decomposing words into morphemes, though first graders evidenced some ability in decomposition skills. The researchers also found that WAT focused on segmentation (PA), while the Definition task focused on semantic/syntactic aspects of morphological processing. The researchers also noted that students had difficulty with derived words that lacked semantic transparency, and thus were not processed by accessing morphological components. Finally, the researchers speculated that students need more extensive morphological knowledge to be successful at manipulating and understanding morphologically complex words. In order know the meaning of morphologically
complex words, students must be able to identify morphemes and know what the morphemes mean. MA is necessary, but insufficient, for deriving word meanings.

In a longitudinal study, Deacon and Kirby (2004) investigated the role MA plays in reading development. They sought to determine (a) whether MA contributes to reading development beyond verbal and nonverbal intelligence, prior achievement, and PA, (b) if it makes a greater contribution to comprehension than word reading, and (c) if the contribution of MA increases over time. Participants were given a measure of morphological awareness in second grade that assessed students’ ability to use analogy to supply the correct past tense inflectional form. Students were also given a verbal and nonverbal intelligence assessment, a measure of PA, and reading, which included pseudo word reading, word identification, and passage comprehension. Students were given these three reading measures in third, fourth, and fifth grade. Results indicated that MA accounts for significant variance in word reading and comprehension, even for a measure of morphological awareness that tapped inflections given years earlier. In addition, the role of MA appeared to increase across grade levels.

**Morphological awareness and older students.** Carlisle (2000) investigated the contribution of MA to reading development. Participants included typical achieving, third and fifth grade students. Measures included a word reading test of morphologically complex words (high frequency including transparent, e.g., *power* – *powerful*, and phonological shift words, e.g., *nature* – *natural*), tests of morphological structure (decomposition: provide base word from a derived form, and derivation: provide a derived form from a base word) to examine knowledge of the relationship between base
and derived forms (transparent and shift), a test of absolute vocabulary knowledge (modified from Anglin, 1993), and a standardized vocabulary and comprehension assessment. For reading morphologically complex words, performance on the shift/derivation task was significantly related to reading shift words in both grades. Performance on decomposition task was related to reading high frequency shift words and low frequency transparent words for third grade students. For both grades, MA was significantly related to vocabulary and comprehension.

Jarmulowicz, Hay, Taran, and Ethington (2008) proposed a metalinguistic model, which begins with oral language influencing PA, to MA, to morphological phonemic awareness (MPA), to decoding, and finally to reading comprehension. To investigate this model, Jarmulowicz et al. measured typically developing, native English speaking third grade students. Students received measures of oral language, PA, MA, MPA, decoding, and reading comprehension. The MPA measure assessed students’ ability to apply the appropriate stress when adding nonneutral suffixes. This measure was administered orally. Path analysis provided support for the model. MPA was associated with the most direct effect on decoding. Oral language and decoding were most directly associated with reading comprehension. MA indirectly influenced both decoding and reading comprehension. Results suggested that instruction in nonneutral suffixes might directly support decoding skills, thereby indirectly supporting reading comprehension.

MPA may be tapping suprasegmental metalinguistic awareness, thus having no direct effect of PA on MPA. Segmenting requires separating sounds, while suprasegmental refers to how speech segments influence other segments of speech with
regard to stress, tone, pitch, and length. Lack of influence of MA on comprehension in this study may be due to the comprehension measure, which did not include many morphologically complex words. Alternatively, third grade may be the time of development where MA is beginning to have an effect on comprehension.

Mahony, Singson, and Mann (2000) investigated the contribution of morphological awareness to decoding for students were in grades three through six, who were typically achieving, native English speaking students. Their morphological measure assessed student’s ability to determine whether a relationship existed between pairs of words, rather than being a production task. They conducted two studies. Results indicated that morphological awareness makes a significant contribution to decoding, accounting for 5% of the variance controlling for vocabulary, with PA accounting for 13% of the variance in decoding, controlling for vocabulary. They did not find a consistent effect of phonological shifts of morphology and difficulty. The authors also found evidence that the contribution of MA to decoding may increase with age, perhaps due to the increase in multisyllabic, multimorphemic words.

In another study, Singson, Mahony, and Mann (2000) conducted two experiments to address whether trends exist in the contribution of PA and MA to decoding from grades three to six. The authors followed similar procedures as in Mahony et al. (2000). In this experiment, the MA measure was a sentence completion task, both written and written plus oral in the first experiment, and a written and purely oral assessment in the second. Participants were middle class, typically achieving, native English speaking
students. Results from the first experiment indicated that MA accounted for 5% of the variance in decoding, after verbal short-term working memory was entered.

Results from the second experiment indicated that MA accounted for 4% of the variance in decoding after vocabulary and PA. In addition, trends were observed. PA made an increasingly smaller contribution to decoding from third to sixth grade, while MA increased its contribution to decoding from third to sixth grade. In fact, PA no longer made a significant contribution to decoding after third grade. Results from this study provide evidence that MA makes greater contributions to decoding in the latter elementary grades.

Carlisle, Stone, and Katz (2001) compared poor and average readers (grades four to nine) in reading morphologically complex words that differed on phonological shifts of derived forms. Difficulty in reading derived words with phonological shifts has been noted with young, average readers. Differences in word naming tasks would indicate that phonological representations in base words interfere with word reading. Because word-naming tasks tap naming proficiency, in which poor readers have difficulty, a second assessment was given. This lexical decision task, which did not require oral production, might indicate the extent of orthographical processing of words. Differences between poor and average readers on the two tasks might indicate that pronunciation is especially difficult for poor readers. Specifically, the investigators sought to determine if differences exist between poor and average readers with regard to transparent and opaque words on naming and lexical decision tasks. Adult readers were included to determine whether differences on word reading for shift words existed. Finally, they sought to
determine the extent to which speed of responding to nonwords contributes to speed of recognizing derived words (opaque and transparent) for both child reader groups.

Participants were recruited from one of two schools for children with learning problems and adults from a university. Measures included vocabulary, WRAT word reading and word attack, and choice reaction time to determine differences in ability between the two groups. Naming required students to read words aloud. Lexical decision required students to determine if letter strings were legal words. For both tasks, shift (phonological shifts as in natural compared to its base nature), stable (no phonological shifts such that the pronunciation of the base in cultural does not change), and foils (only included in the analysis of lexical decision) were included. Speed and accuracy were measured for both tasks.

Results indicated significant main effects for group, task demand, and transparency for accuracy and speed, as well as interactions between group and task demand, group and transparency, task demand and transparency for speed and recognition, as well as a three-way interaction among group, task demand, and transparency for speed. Average readers were better than poor readers on both speed and accuracy. Interactions indicated that the effect for task demand was greater for poor readers, as well as the effect for phonological transparency. The three-way interaction indicated that group differences as a function of phonological transparency were greater on the naming task than on the lexical decision task. Adults, although differences existed on transparency, did not show a difference by task demand. The authors attribute the poorer performance on shift words for poor readers as a difficulty with a specific aspect
of morphology, mastery of the relationship between base form and derived form (e.g., cultural derived from culture). With regard to orthographic sensitivity, there was a difference between legal and illegal words with regard to speed and accuracy, but not group. Speed of response to legal nonwords was the strongest predictor of shift and stable word reading for poor readers, while speed of response to illegal words was the strongest predictor for average readers. Overall, orthographic processing of derived nonwords accounted for more variance in reading real words for poor readers. Poor readers may be accessing both orthographic and phonological representations, while average readers, who have mastered decoding, only attend to orthography.

Carlisle and Katz (2006) sought to determine the affect of MA on reading morphologically complex words for skilled and less skilled fourth and sixth grade EO students. They found that familiarity with base words and morphemes may improve word reading of morphologically complex words. Not surprisingly, skilled readers outperformed less skilled readers in reading morphologically complex words accurately. Moreover, sixth grade students outperformed fourth grade students in reading morphologically complex words.

McCutchen, Green, and Abbot (2008) conducted an extensive examination of the role of morphology in reading skills. They noted that disagreements on the contribution of MA to reading skills could be due to the varied morphological tasks and reading outcomes measured across studies. To resolve divergent findings, they administered a measure of morphology that tapped relational, syntactic, and distributional aspects of words, including half opaque (erosion from erode) and half transparent items (just from
justify), and controlling for word frequency. In addition, students in grades four and six (native English speaking from working middle class neighborhood) were administered tests of PA, vocabulary, word attack and identification, and comprehension. Results indicated that overall fourth and sixth grade students were more accurate on relational items (e.g., determining the base word teach from teacher) than syntactic (given four, provide fourth to complete a sentence) or distributional (determining whether words are legal, e.g. quietness is legal while playness is not). A nonsignificant trend was noted with the difference between 4th and 6th smallest on relational tasks and greatest on distributional tasks. An interaction of transparency existed with grade, with grades similar on transparent items, but 6th graders significantly more accurate on opaque. With regard to the role of MA on reading skills, the researchers found that both PA and MA made significant contributions to word reading and nonword reading, even when vocabulary was entered first.

MA may affect word reading through the addition of semantic and orthographic processing when unknown words are encountered. These results support Tyler and Nagy’s developmental hypothesis. Because morphology contributed uniquely to word reading, these results do not concur with the assertion that difficulties with opaque morphologically complex words are an artifact of phonology. As students become skilled readers, visible text can reveal relationships in orthography obscured by phonology, playing a role in self-teaching mechanisms. Thus instruction in morphology may be a way to compensate for difficulties in phonology for struggling readers.
McCutchen, Logan, and Biangardi-Orpe (2009) found that MA might facilitate word reading. Using a priming task, in which response times were recorded to compare students’ speed in reading word pairs that differed on morphological similarity. Results indicated that fifth and eighth grade students read word pairs faster for morphologically related pairs. They also found that MA was a stronger predictor of word reading than PA. To extend this work, McCutchen and Logan (2011) examined the facilitative role of MA in vocabulary development for fifth and eighth grade students. Findings indicated that students’ ability to analyze words was significantly related to their vocabulary.

Tyler and Nagy (1990) investigated the role of morphology in lexical access. Studies have shown that stem and prefixes and stem and inflectional suffixes affect the speed of lexical access. However, the role of word structure of derivationally derived words in speed of lexical access is less clear. Morphological structure of derived words may have a facilitative or inhibitive effect. Identification of base word and syntactical function may facilitate lexical access (e.g., knowing that justify is a verb). Confusion may also result from different words sharing the same base stem. If morphological elements affect lexical access, fewer errors in semantic interpretations of sentences should occur if students are accessing all forms that share a semantic relationship. An inhibitory effect would be evidenced by increased errors in identifying the syntactic structure of a sentence in which the morphologically complex word occurs. If a greater proportion of errors occurred in morphologically complex words between skilled and less skilled readers, then morphology may play an independent role in word reading. A non-morphologically organized model would predict no differences.
Native English speaking tenth and eleventh grade students from a midsized, Midwestern town were included. An overall reading score differentiated reading groups. A morphological measure was developed in which students had to choose from among four choices which sentence best paraphrased a sentence containing a target word differing on morphological complexity. Sentences were rated on which were easier to understand by independent raters (the preferred condition).

Results indicated that students were more likely to respond correctly for preferred conditions, and slightly higher for suffixed words. Syntactic errors were more common in the nonpreferred condition and with suffixed words. There was also an interaction between suffixation and preference, indicating the effect of preference was stronger for suffixed words. An interaction of suffixation and ability showed that errors for suffixed words were more pronounced for less skilled readers. For syntactic errors, there was a main effect for suffixation.

Predictions were confirmed. Students made fewer lexical errors for suffixed words. Students also made more syntactic errors for suffixed words. Finally, there was a stronger effect of syntactic errors for less skilled readers. Thus, morphologically complex words may both facilitate and inhibit lexical access. Students are better able to derive meanings of morphologically complex words. However, students may also confuse the syntactical role of a morphologically complex word by confusing it with a related morphological word that has a different syntactical role (e.g., assuming justification is a verb because it is related to justify). This was evidenced in more errors for morphologically complex words. Difficulties with syntactical properties of words
may be an area to target especially for struggling readers. Thus, instruction in derivational suffixes may need to include knowledge of how the morpheme affects the syntactical function of a word.

**Morphological awareness and vocabulary.** Dramatic growth in vocabulary occurs during the elementary and middle school years (Anglin, 1993). The explosive growth in vocabulary cannot be directly attributed to words taught within the school year, because not enough words can be taught to account for the rate of growth. Anglin found that increases in children’s vocabulary may be attributed to children’s ability to use “morphological problem solving” to infer meanings of words encountered. Studies have investigated contribution of MA to vocabulary.

Carlisle (2000) found that MA made significant contributions to vocabulary. Overall, students performed better on the morphological assessments for transparent and decomposition tasks. For 3rd and 5th grade students, the derivation task was significant. In support of this finding, Carlisle and Fleming (2003) found that student’s ability to decompose words and know what the morphemes mean was significantly related to vocabulary for fifth grade students.

Evidence exists that students use morphological analysis to derive the meanings of unknown words. McCutchen and Logan (2011) found fifth grade students’ performance on morphological analysis accounted for additional significant unique variance (11.7%) in vocabulary after controlling for word reading, PA, and morphological production. For eighth grade students, morphological analysis accounted
for an additional 12.5% of the variance. Thus, morphological analysis was significantly related to their performance in vocabulary.

**Morphological awareness and comprehension.** MA’s contribution to comprehension is equivocal. Some of the studies mentioned earlier also included comprehension measures. Brittain’s (1970) study included comprehension in the composite measure of reading achievement. Students who performed better on the morphological task also performed better on the composite reading score. However, analysis was not conducted separately for the comprehension measure. Deacon and Kirby (2004) found that MA of inflectional endings made a significant contribution to comprehension for second grade students.

In the study by Carlisle (2000), all three morphology tasks accounted, together, for a large portion of the variance in comprehension. For third grade, reading morphologically complex words was the only unique contributor to comprehension. For fifth grade, the morphological task was significant for reading comprehension. Results indicated that contribution to comprehension shifts from being able to read morphologically complex words in third grade to MA in fifth grade. The design of the study did not allow the researchers to determine if students parse words into morphological components for pronouncing words, which would require a measure of reading speed. Even with partialling out reading morphologically complex words, fifth grade students were still significantly higher on morphological tasks than third grade students, indicating a developmental progression of morphological awareness.
MA may have both a direct and indirect influence on comprehension. McCutchen and colleagues (2008, 2009) found that MA made a significant contribution to comprehension in grades four, five, six, and eight, while PA did not. However, when vocabulary was controlled, MA’s contribution to comprehension was no longer significant, suggesting that MA’s role may be indirectly related to comprehension through a direct influence via vocabulary. Similarly, McCutchen and Logan (2011) found that, after controlling for word reading, vocabulary, PA, and morphological production, morphological analysis accounted for a significant additional 6.8% of the variance in comprehension for fifth grade students. Morphological analysis accounted for an additional 5.4% of the variance in comprehension for eighth grade students, approaching significance. The authors speculate that MA may have both a direct and indirect role in comprehension, but again vocabulary was the stronger predictor, suggesting that MA’s role may be indirect.

**Morphological awareness and struggling readers.** MA may be a particular difficulty for struggling readers. In examining cognitive profiles of students with reading disabilities, Shankweiler and colleagues (1995) compared the relation of measures of phonemic awareness, morphology, and syntax between students with reading disabilities, math disabilities, ADHD, and typical achieving students, ages 7.5 to 9.5. The test of morphology was a production task, in which students had to supply the missing word of a cloze measure with either a derived form or a base word. Results indicated that PA and MA significantly accounted for differences between students with RD and others. For decoding, PA accounted for 11% of the variance while MA accounted for 5% of the
variance. In addition, the researchers found that students had more difficulty with derivations that had a phonological shift. Shankweiler and colleagues interpreted these findings to indicate that RD student’s difficulty with morphology is related to phonological difficulties.

Leong (1989) investigated differences in productive knowledge of derived words that varied in terms of phonological and/or orthographic shifts for poor readers in grades four, five, and six, who were further subdivided into ability groupings based on reading and spelling. Subjects were poor readers based on the Canadian Test of Basic Skills. WRAT-R and spelling tests were administered to further subdivide the groups into better readers, spellers, or both for these poor reading students. Two experiments were conducted. Students were given a prime, and then completed a sentence with a related form. For example, students were given explain, then had to complete a sentence which required explanation. Accuracy and latency were recorded. For the first experiment, students had to provide the derived form from a base word stimulus. For the second experiment, students had to provide the base word from a derived form stimulus. The measures each contained 40 sentences/items that varied along dimensions of no orthographic/phonological change, orthographic change, phonological change or both.

For the first experiment, significant differences were observed for grade, ability, and morphological condition. Older students out performed younger students. Students had most difficulty with increasing morphological shifts, such as orthographic and phonological changes (e.g. explanation has both a orthographic and phonological change from explain). The most impaired ability group performed worst. Similar results were
observed with the second experiment, in which change in both orthography and phonology best predicted subgroups of poor readers. Given that the better readers and spellers of these overall poor readers performed better on these assessments, findings suggests that poor readers of differing ability may be using different strategies, as observed in the faster reaction time of the better readers and spellers. Recognition, production, and vocalization of morphologically complex base forms and derived words appear to impact literacy.

Recently, Tong, Deacon, and Cain (2013) examined if morphological and syntactic awareness are linked to fourth grade poor comprehenders. Fifteen poor comprehending and 15 average comprehending students from a mid- to low-SES schools were identified, matching them on vocabulary, word reading, and reasoning skills, but differentiated based on comprehension ability. Students were administered PA, MA, and syntactic measures. There were two MA measures. On one assessment, students had to provide the correct inflected or derivational form of a word. For example, the examiner orally presented *push: pushed::lose:*[lost]. The second MA measure was based on Carlisle’s sentence completion task in which students had to provide the correct derived form or base word. For the syntactic awareness measure, students were prompted with a sentence that had a syntactic error and had to provide a correct sentence. For the stimulus, “*she brushed* them *teeth,*” students needed to respond with “*she brushed* her *teeth.*”

Analysis revealed that poor comprehenders differed on the syntactic measure and the MA word analogy measure for derived forms. For the MA word analogy measure,
students differed on derivational not inflectional suffixes. These results suggest that students who struggle with comprehension may have difficulties with both MA and syntactic awareness. It should be noted that the sentence completion task (Carlisle, 2000) accounted for significant variation in comprehension for fifth grade students, not third grade students. Students in this study were in fourth grade where it appears that role of MA on comprehension is beginning to shift in importance.

Summary. These studies have found that MA is related to reading skills, such as word reading, vocabulary, and comprehension. In comparisons of typically achieving and poor readers, research has confirmed difficulties in MA for struggling readers. From fourth through ninth grades, Carlisle et al. (2001) found that average readers were better able to read morphologically complex words. Poorer readers had more difficulty with words that had undergone phonological shifts and had not mastered the MA relational knowledge (e.g., erode is related to erosion). In addition, students who struggle with comprehension may also differ from typically developing peers in the MA (Tong et al., 2013). Studies also suggest that MA may not be sufficient for deriving word meanings (Carlisle & Flemming, 2003) and that MA significantly contributes directly to vocabulary and indirectly to comprehension through vocabulary.

Morphological Awareness and English Language Learners.

Studies have also explored the role MA plays in reading development for ELLs. If MA contributes to both word reading and comprehension for ELLs, it may be a useful target for intervention.
Ramirez, Chen, Geva, and Kiefer (2010) investigated the role of MA in first and second language for English word reading of ELLS in grades four and seven. Results indicated that MA in English was significantly associated with word reading (accounting for 6% of the variance) beyond grade-level, vocabulary, and PA, with PA and MA unique predictors of English word reading. In addition, Spanish MA was significant, accounting for an additional 5% of the variance in English word reading, but was not a unique predictor. Beyond grade-level, vocabulary, and PA, Spanish MA significantly contributed to Spanish word reading, accounting for an additional 11% of the variance. Similar to English word reading, Spanish PA and MA were the only unique predictors of Spanish word reading. English MA did not significantly contribute to Spanish word reading. Findings lend support for the development of MA in L1 in order to facilitate word reading in L2.

Kieffer and Lesaux (2008) investigated the role of MA in ELLs’ reading comprehension for fourth and fifth grade from an urban, low SES setting. Students were given a derivational task in which students had to derive the base form of a derivationally suffixed word in order to complete a sentence. Comprehension was measured by a cloze passage comprehension test and a multiple-choice test. Control measures included PA, word reading, and vocabulary measures. Results indicated that for fourth grade students, MA made a small contribution to comprehension, approaching significance. However, for fifth grade students, MA made a moderate and significant contribution to comprehension for both measures. Findings indicate that MA begins to make a significant contribution to comprehension in the upper elementary grades for ELLs.
In what way does MA contribute to comprehension? Does it directly influence comprehension because students are able to use knowledge of morphemes for real time comprehension? Or does MA contribute indirectly to comprehension through facilitating reading of morphologically complex words and increasing vocabulary knowledge? Or both? In a study with middle-school students (grades 6th through 8th), Kieffer, Biancarosa, and Mancilla-Martinez (2012) examined the contribution of morphological awareness (MA) to reading comprehension. Students were from schools characterized by low SES, 91% Latino, and 79% ELLs. Beyond decoding, sight word reading, fluency, listening comprehension, and grade level, MA made direct, significant contribution to reading comprehension, accounting for 4% of the variance. Indirectly, MA made a significant contribution through vocabulary and fluency, but not word reading. The direct or indirect contributions of MA on reading comprehension did not differ for ELLs across English language proficiency levels. MA may contribute to comprehension because students are able to more quickly read and understand words, as indicated by the indirect influence of MA through fluency and vocabulary. Findings suggest that ELLs, regardless of English language proficiency, might benefit from reading instruction that includes the morphological structures of language in order to enhance comprehension.

In another study, Kieffer and Lesaux (2012) focused on sixth grade ELLs who were Spanish-, Vietnamese-, and Filipino-speaking. Comprehension measures included a multiple choice and researcher created expository text assessment. The morphological measures included a decomposition task, in which students extracted the base from a derivational form of the word, and a nonword task, in which students had to supply the
correct derived form based on the syntactic role of the word. Other measures included vocabulary and word reading. Using structural equation modeling (SEM), the researchers found that MA had a significant direct effect on word reading, vocabulary, and comprehension. However, MA did not make an indirect contribution to comprehension through word reading. This may be due to the decreasing impact of word reading to comprehension for older students. This study provides support for MA contributing to comprehension across different languages.

In a follow up study, Kieffer (2013) investigated the relationship between MA and reading difficulties, comparing sixth grade Language Minority Students (LM; Spanish) and EOs. Students predominately came from schools that served low SES communities. The LM students included all students who spoke another language other than English at home. Of these LM students (N=82), 13 were ELLs, students who had not gained English language proficiency. Students were administered a comprehension, word reading fluency, and MA assessments. The MA measure was a sentence completion task in which a sentence were read aloud to students, who had to provide a correct derivational form of the nonsense word (“The man was a great ________.”) Students needed to choose a correct derived form a list of four choices read aloud (tranter, tranting, trantious, tranful). Students were classified as skilled readers and readers with reading difficulties (RD). The RD students were further classified into three sub groups, RD in comprehension, RD in word reading, and RD in both of comprehension and word reading.
Overall, results indicated that skilled readers outperformed RD students on the MA task. In addition, RD students with difficulties in word reading and comprehension subgroup had the lowest MA scores. Next, results were disaggregated by language status. Overall, LM students with RD had weaker scores on MA than EOs with RD. Analyzing the results by subgroup, LM students with RD were weaker in MA than EO students with RD for the comprehension and comprehension/word reading subgroups, although only the comprehension subgroup reached statistical significance. Of note, there were no differences between LM and EO skilled readers on the MA task.

Finally, Kieffer examined the prevalence of MA weaknesses by reading skill and language status. MA weakness was greater in students with reading difficulties (45%) than skilled readers (11%). By subgroup, percentages were 38% for students with comprehension difficulties, 44% for students with word reading difficulties, and 63% of students with difficulties in both word reading and comprehension. Disaggregated by language status, the percentage of students with MA weaknesses was greater for LM students with RD than EOs with RD.

Results of this study further provide further evidence that MA is linked to reading difficulties. MA was a weakness for both EOs and LM students. Of particular interest to this study, the MA task tapped students’ ability to choose a correct derived form. Moreover, that weakness in MA was more prevalent in LM than EOs suggests that MA might be an important intervention target for ELLs, although the LM students in this study included students who were proficient in English.
Summary. Much of the research into the effect of MA on reading development has been conducted with typically developing students. MA is less developed in students who struggle with reading and may be a source of reading difficulties. Studies indicate that, without explicit instruction, a developmental trend exists in which MA begins to make contributions to word reading and comprehension that exceed the role of PA around fourth grade. There is also increasing evidence that MA has an indirect role in comprehension through vocabulary. Finally, recent research indicates that MA may play a role in word reading, vocabulary, and comprehension for ELLs, and may also be a source of reading difficulties.

Effective Instruction in Morphological Awareness

Morphological awareness has been shown to make significant contributions to reading achievement. The studies reviewed thus far have examined the link between MA and reading skills. What is known about how to effectively instruct MA? More than 25 years ago, White, Sowell, and Yanagihara (1989) suggested that morphological instruction begin in the middle elementary grades. Prefixes should be taught in order to promote active use of word-part clues to derive meaning. They examined the Word Frequency Book (Carroll, Davies, & Richman, 1971) and determined the most frequently occurring prefixes and suffixes. The most common 9 prefixes accounted for 76% of prefixed words in WFB. The most common 10 prefixes accounted for 85% of suffixed words, with inflectional endings -s/-es, -ing, and -ed accounting for 65% of occurrences. Challenges teaching prefixes include inconsistent meanings (negative and reversative meanings of un- and dis-, unhappy and untie), false analysis (unite), and relying on only a
word part clue, but each can be overcome through careful instruction. Their recommended lesson sequence includes

- explicitly define and teach the concept of prefixes through examples and nonexamples. Teach that prefixes are groups of letters in front of base words that change the meaning of words. When the prefix is peeled off, a word must be left.
- Group prefixes with similar meanings. For example, both *un*- and *in*- mean not
- Finally, use sentences to teach how to apply knowledge of prefixes to derive meanings of prefixed words, and have students check to make sure the meaning makes sense in the context of a sentence.

Middle elementary students should also be taught how to remove suffixes to identify meaningful words/roots, even though suffixes may serve mainly grammatical purposes that could also be gleaned from the contexts. White et al. recommend first teaching the concept of a suffix by teaching neutral suffixes first and having students identify the suffix and root word. Then teach words in which suffixes result in spelling changes.

A growing body of evidence indicates that children can be taught to use morphology to improve vocabulary achievement. While instruction in PA and decoding are essential to reading in the early elementary years, instruction should progress to include study in word structure as students progress through the grades (Henry, 1988, 1989, 1993). Carlisle (2010) reviewed the impact of morphological awareness interventions on reading skills. Inclusion criteria were (1) instruction in MA; (2) pre- and post-measures of MA and at least one measure of reading skill; (3) participants were
school aged; and (4) and the inclusion of a control/comparison group. Studies were
group according to whether the literacy measure was phonological, orthographic, or
semantic. Although results were mixed, the studies suggest that students can develop
MA and that it may have a positive effect on word reading skills. Seven studies
examined the relationship of MA and orthographic development and its impact on
reading and spelling. Students in the Chinese studies made consistent positive gains
through training as young as kindergarten. In contrast, results from English studies were
less consistent, but findings suggest that morphology may benefit spelling and reading
and that older students (i.e., around 4th grade) may benefit more from morphological
training than younger students. Four studies examined MA and word learning, with
morphological analysis as a strategy for determining word meanings. Overall, the review
of these studies suggests that students can be taught to use word analysis to derive
meanings of unknown words.

As MA intervention is a burgeoning field in educational research, Carlisle found
this as an opportunity to examine different approaches for instructing MA. Four different
approaches and their instructional applicability were identified, although many studies
used a combination. One approach is to use activities and instruction aimed at increasing
MA. This approach was appropriate for early stages of reading development, but
insufficient for impacting later MA development, which in turn impacts later reading
skills such as comprehension. A second approach was to teach the meaning of
morphemes. This approach provides important and necessary knowledge for students in
order to determine the meaning of unknown words. A third approach involved
morphological problem solving, creating opportunities for students to think about how MA could assist them in reading and spelling words and finding meaning. This approach fosters the development of reasoning skills in using morphological elements to solve problems while reading. The fourth approach taught students a morphological analysis strategy for finding the meaning of unfamiliar words. The goal of this approach is to promote student’s confidence in utilizing morphological elements to derive the meaning of words. To achieve this goal, students need explicit instruction and ample practice in deriving the meaning of words using morphemes. Thus, if the goal of an intervention is for students to derive the meaning of unknown words using morphological elements, students need explicit instruction in a morphological analysis strategy.

Goodwin and Ahn (2010) conducted a meta-analysis of morphological interventions that targeted literacy skills. Inclusion criteria were (1) instruction in morphological units, emphasizing meaning; (2) pre-/post-test group design; (3) school aged; (4) study was published in English; (5) published since 1980; and (6) the study provided sufficient data for effect size inclusion. 17 studies met inclusion criteria. The overall effect for morphological interventions was 0.33, a moderate and significant effect. The authors also compared effects of studies based on key features. Interventions were more effective when combined with other literacy skills. Morphological interventions that focused on vocabulary, reading, or “other” (writing or speech) produced stronger effects. For literacy outcome, PA showed the largest effect (d=.49), followed by MA (0.40), and vocabulary (0.40). Statistically significant effects were found for comprehension and spelling (0.24 and 0.20, respectively), but not for decoding, and

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negative effects were found for fluency. Analysis also indicated that the strongest effect sizes were associated with interventions lasting 10 to 20 hours, that positive gains were associated with various group sizes, and students with learning difficulties (ELL, RD, struggling readers, speech impairment) benefitted from morphological interventions.

Bowers, Kirby, and Deacon (2010) conducted another review of morphological interventions. Inclusion criteria included (1) published in English, (2) preschool to eighth grade students, (3) investigated any element of morphology, (4) instruction comprised 1/3 of instructional time, (5) literacy measures were reported; (6) an experimental and control/comparison group design. Outcomes were coded as sublexical (further divided as morphological–identifying the correct derived form, and nonmorphological–phonemic awareness), lexical (word reading or vocabulary), and supralexical (such as comprehension). Of the 22 studies identified, all targeted affixes, but less than half also focused on base words. Some studies focused exclusively on morphemes, others integrated morphology with other literacy instruction. Effect sizes were calculated based on type of outcome and design; alternative treatment control groups were differentiated from comparison control groups in that the alternative treatment received an intervention that has already been shown to be effective. Findings indicated that sublexical–morphological outcomes had the highest ES (0.65) for treatment versus a comparison group. The effect size was 0.51 for treatment versus alternative treatment. For sublexical–nonmorphological, treatment versus comparison was 0.34, for treatment versus alternate treatment it was 0.08. For lexical outcomes, experimental versus control effect size was 0.41; 0.21 for experimental versus alternative treatment. For supralexical,
effect size for experimental versus control was 0.28 and -0.08 for experimental versus alternative treatment.

Overall these interventions had the strongest impact at the sublexical level. There were moderate effects on lexical outcomes and small effects on distal measures such as comprehension. Young learners (pre-k to second) benefited as much from the MA as older students (3rd to 8th). The author’s also note in analyzing the weaker ES for studies that included an alternative treatment that these alternative treatments are already established as being effective. Thus, a possible interpretation is that MA intervention is on par with other well-established interventions.

These reviews suggest that MA instruction may improve reading skills. In order to determine specific instructional elements and how MA instruction affects achievement of students from various background characteristics, I next review specific studies in MA.

In an early study, Henry (1989) investigated the effectiveness of supplementing basal curriculum with word structure instruction for third and fifth grade students. Two experiments were conducted. The intervention included instruction in phoneme/grapheme correspondence, syllable structure, and morphemes within the context of the layers of language within English. These layers include language elements consisting of words of Anglo-Saxon, Latin, and Greek language origins. For both experiments, students in the intervention group made significant gains in spelling and word reading compared to controls, especially in affixed and multisyllabic words, suggesting that explicit instruction in morphemes can have a positive impact on students’ word reading.
More recently, Kirk, and Gillon (2009) examined the effects of integrating morphological awareness instruction with phonology, orthography, syntax, and semantics for affluent students with reading difficulties (aged eight to eleven), but otherwise average verbal skills. Students received from 16 to 22, 45-minutes sessions. Three time points were measured: prior to the intervention, after the experimental group received the intervention, and after the control group received the intervention. The focus was on learning orthographic patterns, rather than whole words. These patterns included patterns for morphologically simple words and patterns for inflectional and derivational suffixes. Instructional activities included word sort and dictation, which included prompting by the teacher and self-prompting by students based on patterns taught. Measure included 30 taught and 30 untaught words matched to the patterns taught. Results indicated that both groups improved in reading words after receiving the intervention, as well as in spelling. Although students increased in reading both taught and untaught words, results were stronger for taught words. Results suggest that focus on morphological patterns during instruction can have positive effects on word reading and spelling for struggling readers. ELLs were not included in this study, however.

These two studies examined the effects of interventions that included morphological instruction for word reading and spelling. Others have investigated instruction to teach the meaning of morphemes. Using a single case design, Fishley, Konrad, Hessler, and Keesy (2012) examined whether high school students with high incidence disabilities could learn meanings of morphemes using graphic organizers. The graphic organizers included the target morpheme, definition, and examples of words with
the morpheme, and tutors used speed practice to review the morphemes. Results indicated that students significantly improved their ability to quickly identify the definition of morphemes. The instructional approach used in this study corresponds to the second approach identified by Carlisle (2010). The intervention targeted teaching the definition of morphemes. This knowledge is necessary. However, knowledge of suffixes alone may be insufficient for students to be able to determine the meaning of words, especially students ELLs with reading difficulties.

Other studies have investigated the impact of morphological instruction on vocabulary. Recently, Ramirez, Walton, and Roberts (2013) investigated whether MA training targeting compound words might improve MA and vocabulary skills for kindergarten students of different levels of literacy development. In addition, they sought to determine if MA growth predicts vocabulary development and does vocabulary growth predict MA development. Most students were EOs (86%) and from schools that served low SES communities. Teachers provided at minimum 24 sessions, lasting 30 minutes. During whole group instruction, teachers taught students how to identify compound words. Small group practice followed, providing opportunities for students to create new words using the individual words of compound words.

Results indicate that students made significant gains on the morphological awareness (compound words) and vocabulary measures. Students in the lowest ability groups made the strongest gains in both vocabulary and morphological awareness. Moreover, students in the lower ability groups were significantly different on vocabulary measure prior to the intervention, but not significantly different at the conclusion of the
intervention. The researchers also found an association between initial morphological awareness and vocabulary scores and morphological awareness at posttest and an association between initial vocabulary scores and vocabulary scores at posttest. These findings are promising, suggesting that young students from a low-income background can increase vocabulary and morphological awareness through direct instruction; however, lack of a control group limits generalizability of the results.

Studies have also examined the effects of integrated morphological instruction with other approaches. Wysocki and Jenkins (1987) investigated student’s use of contextual and morphological information to determine word meanings. The authors begin by noting three explanations that have been given to account for the dramatic growth in estimated vocabulary between elementary and middle school: (a) direct instruction, (b) learning through context, and (c) morphological generalizations. Three questions guided the research: Do middle grade students differ in ability to infer word meanings from (a) sentence contexts? (b) use of morphological information? and (c) combined context and morphological information?

Participants were fourth, sixth, and eighth grade students matched for reading achievement. Two word sets with twelve, low frequency word pairs were chosen (stimulus and transfer words that were morphologically related). One set was explicitly taught. The other set was used as a control set of words that were not taught. Three vocabulary assessments were given with 9 sentences each: three with stimulus words in weak contexts; three with transfer words in weak contexts, and three with transfer words in strong contexts. Students received training on taught words over three, 15- to 20-
minute sessions. Students practiced reading the word, rehearsing definitions, and supplying definitions. Sessions began and ended with a quick quiz. Testing was delayed two weeks to provide a more natural morphological generalization context.

Significant differences emerged for taught versus untaught words, but not for grade, nor was there an interaction. All students performed better in strong contexts, with sixth and eight grade students outperforming fourth grade students overall and in the strong context condition. For morphological generalization, again sixth and eight grade students performed better overall, and students performed better on strong contexts and on taught words. However, a three-way interaction was detected. For weak context sentences, all grades performed better on transfer than control words, but sixth and eight grade students outperformed fourth grade students on transfer words. In strong context, students did not differ on transfer words, but sixth and eighth grade students outperformed fourth grade students on control words. The authors also noted that the mean on strong context transfer words approached the mean on the stimulus words. Results also indicated that older students might be better able to use morphological information to derive word meanings. However, older students may have benefitted from the short duration because of prior knowledge and greater MA that they already posses. Fourth grade students still benefitted from the intervention, but may require longer duration for generalization to untaught words.

The instruction in this study did not include an explicit morphological analysis strategy to determine word meaning. Moreover, the assessment included the words in context; students could have relied on context clues to find the appropriate meaning of
words. Thus, although results suggested that students were better able to identify the meaning of morphologically related words than the control students, these results could not be attributed to morphological instruction.

Carlo, et al. (2004) investigated various aspects of effective vocabulary instruction. Of interest to this study, the intervention included instruction in morphological analysis. Using a quasi-experimental design, fifth grade classrooms were assigned to treatment and control conditions, of which more than half of the students were ELLs. Ten to 12 words were instructed weekly for 15 weeks, 45 minutes a day. Students received instruction in the word meanings, opportunities to read the words in texts and identifying word meanings using context, small group work in choosing which target word completed a sentence, deeper processing activities (Beck, McKeown, & Kucan 2002), and instruction in morphemes. Students were assessed on comprehension, words taught during the intervention, the depth of knowledge of a word (half which were instructed), and a morphological awareness test adapted from Carlisle (2002).

Overall, the intervention group showed greater gains than the comparison group, specifically on the words taught during the intervention, which is to be expected. The intervention was equally effective for EOs and ELLs. On the morphological task, which was written and graded for spelling, students made marginal gains. Difficulties arise in attributing results to morphological instruction due to the use of a quasi-experimental design (interactions occurred as a function of site) and that morphological instruction was part of a more comprehensive vocabulary intervention. Studies that focus specifically on
morphological analysis training are needed to determine if it is effective in increasing student’s vocabulary knowledge, especially for ELLs.

Baumann and colleagues conducted two studies that included instruction in deriving word meanings using morphemes. Bauman, Edwards, Font, et al. (2002) investigated whether an intervention in morphemic and contextual analysis would increase vocabulary and comprehension for fifth-grade students, investigating (a) immediate and delayed effects for inferring meaning on instructed and transfer words, (b) effects on students’ comprehension of texts containing morphologically and contextually decipherable words, and (c) differences when morphemic and contextual analysis were provided in isolation or in conjunction. They employed a quasi-experimental design, with students from a diverse public elementary school (predominantly African American and white). Four elementary fifth grade classes were randomly assigned to one of four conditions: control, morphemic analysis, contextual analysis, or both morphemic and contextual analysis. Students were evaluated on their ability to learn low frequency vocabulary words using a pre-/post-assessment design. The pre-assessment was a 40-item test that included 14 instructed words (morphemic and context instructed words) and 26 transfer items (morphemic and context words that were not instructed). The post-assessment consisted of 7 measures: (a) immediate production assessment of morphemic words (10 instructed, 20 transfer); (b) immediate recognition of morphemic words (10 instructed and 20 transfer); (c) immediate production assessment of context words (10 instructed, 20 transfer); (d) immediate recognition of context words (10 instructed and 20 transfer); (e) passage comprehension containing morphemic and context words
(instructed and transfer); (f) delayed re-administration of the morphemic recognition assessment; and (g) delayed re-administration of the context recognition assessment.

The study included four groups. For the morphemic only group, students received twelve, 50-minute lessons on eight frequent prefixes, consisting of explicit instruction and cumulative review. For the context only group, students received twelve 50-minute lessons on contextual analysis, generic and specific context clue strategies. The morphemic-context group received a combination of both approaches. The target words were included in the intervention of each respective group; transfer words were not. The control group also received twelve, 50-minute lessons, in which students read and discussed a trade book. The experimental groups followed an explicit instructional format with introduction of the strategy, modeling, guided practice, and gradual release. Intervention teachers rotated through each condition. Measures included a standardized vocabulary test and subset of the target and transfer words at pretest. Posttests included immediate production and recognition of morphemic and context instructed and transfer words, and a delayed recognition of morphemic and context instructed and transfer words.

Groups did not differ on the vocabulary pretests. Results indicated that students receiving instruction in each group performed significantly better on words that were taught during those lessons. For example, the context group performed better on assessments that required students to derive meaning using context clues. Effects were evident for both immediate and delayed measures. For prefixed transfer words, there was evidence of an immediate effect of the intervention in morphemic analysis, but not on the
delayed, generalization measure. For the context intervention group, the immediate
effect for context transfer words was not as strong; there were no significant differences
on the delayed, generalization measure. Results also did not indicate a significant
difference on students’ ability to comprehend text containing morphologically complex
or contextually decipherable transfer words. In addition, results indicated it might be as
beneficial to combine morphemic and contextual analysis as to teach them separately.
Study participants were neither ELLs nor poor readers. Students who are poor readers
and ELLs may not be able to rely on context clues due to limited vocabulary knowledge.

In a follow-up study, Baumann, Edwards, Boland, Olejnik, and Kame’enui (2003)
expanded upon Baumann et al. (2002) study. In this study, classroom teachers taught the
lessons, the researchers embedded instruction within the school’s social studies
curriculum, and reduced the instruction from 50 minutes to 15 minutes to be included in
the social studies block.

The treatment group was an integrated morphemic analysis and context clues
group (MC); the alternative treatment group received textbook vocabulary (TV)
instruction. The researchers investigated the effects of the treatment on vocabulary
acquisition, students’ ability to use context clues and morphology to derive word
meanings, on comprehension of passages containing morphologically and contextually
decipherable words, and on learning social studies content.

Students were from a mid-sized city, predominately African-American and
Caucasian, of whom 57% received were from low SES background. The study employed
a quasi-experimental design; classrooms were randomly assigned to MC and TV
conditions with each receiving 30 minutes of social studies instruction and 15 minutes of vocabulary instruction. In the TV condition, students were directly taught the meaning of words through a variety of activities: glossary definitions, comparing and contrasting, prediction and confirmation, semantic mapping, and examples and nonexamples. In the MC condition, students were explicitly taught strategies to use context clues and morphemes to find the meaning of words. Morpheme clues were taught before context clues to avoid confusion.

Measures included two pretests and seven posttests. Pretests were a normed vocabulary test and a content test adapted from the social studies unit. At posttest, students were measured on textbook vocabulary production, word part vocabulary production, immediate and delayed vocabulary context test (use of morphemic and context strategies), an adapted comprehension test (requiring students to ascertain the meaning of words to select the correct response), and a chapter test from the social studies textbook.

Students did not differ significantly at pretest on either measure. For the textbook vocabulary measure, TV outperformed MC group as expected. Students in the treatment group outperformed the TV group on morphologically decipherable words in isolation. On the immediate context vocabulary test, TV and MC groups did not differ significantly. Students in MC scored significantly higher on the delayed context vocabulary test. Groups also did not differ on the passage comprehension or chapter tests.
Results indicated that students benefited from the type of instruction received. The TV group, who received instruction in content vocabulary, outperformed the MC group on content vocabulary. The MC group, which received instruction in morphemic analysis, outperformed the TV group on the word part test. Results were equivocal for the context vocabulary measure. Groups did not differ at immediate posttest, but did differ on the delayed posttests, albeit small effect ( $\eta^2 = 0.016$). The authors speculate that vocabulary items frequency may have been higher and that the text provided explicit clues to the word meanings (11 of the 39 items contained explicit context clues that may have assisted both groups in deriving meaning). In addition, based on the stronger performance on the delayed measure, students may take more time to internalize learning.

Results from this study suggest that students from a racially diverse school can employ morphemic analysis to derive the meaning of morphologically complex words, although students received instruction in both morphological analysis and contextual clues strategies. As evidence, students in the MC group outperformed the TV group on the word part assessment ( $\eta^2 = 0.423$, a strong effect). This study did not explore whether ELLs would benefit from MA instruction. Students were not disaggregated by language proficiency and two students who were recent immigrants were excluded.

Bowers and Kirby (2010) investigated the effectiveness of an intervention to increase vocabulary and identification of morphological elements. Debate exists about the effectiveness of wide versus deep vocabulary instruction on student vocabulary acquisition. Because of the volume of words acquired in the elementary grades, is it better to briefly cover many words or fewer words in more depth? Which method might
have a greater impact on vocabulary acquisition? The authors sought to determine if an intervention for grades four and five would (a) would help students to identify the base of morphologically complex words; (b) lead to gains in vocabulary knowledge; and (c) explain variance in vocabulary knowledge. Participants came from two fourth and two fifth grade classes from two public Catholic schools, one suburban and one small town. Students with disabilities and ELLs were excluded.

Measures at pretest included the PPVT-III to control for prior vocabulary knowledge. Two constructed posttest measures were given to assess base word identification and morphological vocabulary. The same 30 words were used for both assessments with ten words in each category: (a) Words Taught, (b) Base Taught (base words and affixes taught, but not together) and (c) Affix Taught (affixes, but not the base words, were taught). The second two categories, Base and Affix Taught, were considered transfer measures as students had to apply skills learned to words not explicitly taught during the intervention. Participants received 20, 50-minute sessions in which researchers taught spelling patterns of base words and inflectional and derivational suffixes. Students were involved in an inquiry based instructional sequence. Students used visuals (matrix and flow chart) to assist with spelling (oral and written). Results indicated that students receiving the instruction were better able to identify bases of words for all three types of words (Words, Base, and Affix Taught), although differences between experimental and control groups diminished with the transfer measures Base and Affix Taught. For Morphological Vocabulary, students in the treatment condition outperformed the control group in their ability to define words that were included in the
intervention and words with bases and affixes that were taught during the program, but not instructed in that particular derived form. For derived words in which only the affix was taught, treatment and control students did not differ. These findings indicate that fourth and fifth grade, native English speaking, typically achieving students can be taught to identify morphological elements and use this knowledge to determine the meanings of unknown words.

This ability to identify morphological elements impacted vocabulary knowledge, at least for words with bases and affixes explicitly taught in the intervention. Students who received the intervention had significantly greater growth on morphological vocabulary than the control group, even when the focus was on spelling patterns of morphemes. Awareness of the morphological structure of words allowed students to determine the meaning of unknown words. To support this finding, the authors note that prior vocabulary knowledge explained greater variation in morphological vocabulary for the treatment group (66.6%) than the control group (43.7%), which may balance the competing depth vs. breadth vocabulary debate.

This study has implications for instruction for ELLs. Study participants were typically developing, native speakers of English. Yet, the experimental group did not outperform the control group on words in which the affix, but not the base word, was taught, suggesting the ability to apply knowledge of words structure required knowledge of the base words as well as affixes. If typically developing native speakers of English require explicit instruction in base words in order to generalize morphological knowledge
to novel words, then instruction in morphological analysis for ELLs should include instruction in base words so they can apply this newly learned skill.

**Summary.** Researchers have investigated the effects of morphological interventions on reading skills. Studies suggest that explicit instruction in morphological analysis may provide a self-teaching mechanism for expanding vocabulary, although the research base is still small. Results have indicated that students can be taught to use morphemes to derive meanings of unknown words. However, most of the research has been conducted with typically developing EOs and has combined morphological instruction with other skills. Little investigation has been conducted into whether struggling ELLs might benefit from an intervention in morphological analysis strategy. Given the vocabulary struggles of ELLs, an intervention in morphological analysis may be an avenue in which to increase ELLs’ vocabulary through their ability to derive word meanings.

**Research Question:**

ELLs lag behind EOs in reading achievement, resulting in greater difficulty in academic achievement, increased identification for special education, and higher drop out rates. This is due in part to ELLs’ diminished vocabulary knowledge. Because of the immense vocabulary gap between ELLs and EOs, it is difficult to directly teach sufficient numbers of words to close that gap. Thus, an intervention that teaches students to derive meanings of unknown words could facilitate vocabulary growth by establishing the basis for a self-teaching mechanism as students encounter words during independent reading.
In addition, as students progress into the upper elementary grades, the nature of vocabulary shifts, with greater occurrence of morphologically complex words. While the words become more complex morphologically, morphological derivations provide students with an opportunity to determine the words’ meaning. Thus, this study seeks to answer the following research questions:

1. Would an intervention teaching a morphological analysis strategy increase the ability of English language learners who are struggling readers to derive word meanings?

2. Will students be able to transfer the skills learned to untaught words containing morphological elements (such as base words and suffixes) taught during the intervention?

3. Would the intervention be effective for some students and not others based on students’ background characteristics (i.e. grade, vocabulary and comprehension level)?

It was predicted that an explicit intervention in morphological analysis strategy would increase student’s ability to derive the meaning of unknown words and transfer this skill to other words that were not instructed in the intervention. It was also predicted that students would not differ based on grade level or background characteristics.

**Chapter 3: Method**

**Setting**

The participating school is located in a large urban school district in Southern California. It was a Title I, low socio-economic status (SES) school with a population of
859 students (129 and 136 fourth and fifth grade students, respectively), of which 435 are Spanish speaking ELLs (46 fourth grade and 43 fifth grade students). The student population is 100% Hispanic. On the 2012 California Standards Test (CST), 47% of fourth grade and 48% of fifth grade students scored proficient or advanced. For previous years, 55% (2011) and 46% (2010) of fourth grade students scored proficient or advanced; 42% (2011) and 39% (2010) of fifth grade students scored proficient or advanced. For ELLs during the 2012 CST, only 16% of fourth grade students scored proficient (no student scored advanced) and only 14% of fifth grade students scored proficient (no student scored advanced). On the Word Analysis and Vocabulary subtest of the CST, fourth grade ELLs answered 52% of the questions correctly; fifth grade ELLs answered 50% of the questions correctly, which is lower than English only, Initial Fluent English Proficient, and redesignated students who answered 78% and 67% correctly (fourth and fifth grades respectively).

Participants

Criteria for Selection. Studies show that morphological awareness begins to make a greater contribution to reading comprehension beginning around fourth grade for typically developing students (White, Power, & White, 1989). Therefore, students in grades four and five were selected. In consultation with classroom teachers, ELLs, with an English language development (ELD) level of three, four, or five, who are struggling in reading were identified to determine if students from this grade range might benefit from morphological analysis training. After securing parent and student consent, students were screened for reading difficulties. Because the goal of this study is to
improve English vocabulary skills for ELLs who are struggling readers, students were screened using the oral reading fluency scores from the *Dynamic Indicators of Basic Early Literacy Skills* (DIBELS; Good et al., 2011). Beginning of year cut points from DIBELS indicating were used. Student scoring below 90 and 111 (fourth and fifth grade respectively) words correct per minute were included in the study. Serious difficulties with decoding may impede students’ ability to participate in and benefit from this intervention. Therefore, students scoring below 30 words correct per minute were excluded. Table 1 provides descriptive statistics.

Table 1

<table>
<thead>
<tr>
<th>Participant</th>
<th>Grade</th>
<th>ELD Lvl</th>
<th>WCPM</th>
<th>WJ WID&lt;sup&gt;a&lt;/sup&gt;</th>
<th>WJ WA&lt;sup&gt;a&lt;/sup&gt;</th>
<th>DAZE</th>
<th>WJ COMP&lt;sup&gt;a&lt;/sup&gt;</th>
<th>PPVT&lt;sup&gt;a&lt;/sup&gt;</th>
<th>TVIP&lt;sup&gt;a&lt;/sup&gt;</th>
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<td>3</td>
<td>57&lt;sup&gt;b&lt;/sup&gt;</td>
<td>99</td>
<td>97</td>
<td>10&lt;sup&gt;c&lt;/sup&gt;</td>
<td>85</td>
<td>89</td>
<td>68</td>
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<td>4</td>
<td>54&lt;sup&gt;b&lt;/sup&gt;</td>
<td>92</td>
<td>92</td>
<td>10&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>4</td>
<td>77&lt;sup&gt;c&lt;/sup&gt;</td>
<td>100</td>
<td>107</td>
<td>11&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>99</td>
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<td>86</td>
<td>105</td>
<td>11&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>92</td>
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<td>12&lt;sup&gt;c&lt;/sup&gt;</td>
<td>87</td>
<td>83</td>
<td>86</td>
</tr>
</tbody>
</table>

*Note.* ELD Lvl = English Language Development Level; WCPM = DIBELS Words Correct Per Minute; DAZE = DIBELS; WJ Comp = Woodcock-Johnson III Passage Comprehension; PPVT = Peabody Picture Vocabulary Test; TVIP = Test De Vocabulario Imágenes Peabody; WJ WID = Woodcock Johnson III Word Identification Subtest; WJ WA = Woodcock Johnson Word Attack Subtest. <sup>a</sup> = standard scores reported with a mean of 100 and a standard deviation of 15. <sup>b</sup> = well below benchmark goals on DIBELS measure. <sup>c</sup> = below benchmark goal on DIBELS measures.

David<sup>2</sup> was a fourth grade male student with an English Language Development level (ELD) of 3. He read 57 words correct per minute (WCPM) on the DIBELS oral reading fluency passages, well below the benchmark goal. His word reading and

<sup>2</sup> *Note.* Pseudonyms were used for students to protect their identity.
decoding skills were in the average range; his Word Identification (WID) and Word Attack (WA) scores on the Woodcock-Johnson III were 99 and 97, respectively. For comprehension, his DAZE score on the DIBELS measure was below the benchmark (10) and his Passage Comprehension (PC) score was in the low average range (85). For vocabulary, his Peabody Picture Vocabulary Test (PPVT) was 89 while his standard score on the Test de Vocabulario Imágenes Peabody (TVIP) was 68. He struggled with reading words fluently and comprehension.

Jaime was a fifth grade male student with an ELD level of 5. His WCPM was 104 below the benchmark goal. His WID score was 86, in the low average range, and his WA score was 105 in the average range. His DAZE score was 11, well below the benchmark goal. His PC was 77, over a standard deviation below average. His PPVT and TVIP scores were average, 92 and 89 respectively. He struggled with word reading and comprehension.

Aron was a fifth grade male student whose ELD level was 3. His WCPM score was well below the benchmark score, 86. His WID was in the low average range (88); his WA score was in the average range (95). His comprehension score on the DAZE was at benchmark. His PC score was in the average range (94). His PPVT score was average (90), while his TVIP was below average (62). Aron struggled with reading words fluently.

Jasmin was a fourth grade female student. Her ELD level was 4. Her WCPM (54) was well below the benchmark goal. Her WID and WA were average (both at 92). Her DAZE score was well below the benchmark goal (10). Her PC was in the low
average range (87). Her PPVT was in the low range (87), while her TVIP was in the high average range (108). Jasmin had difficulties with fluency, comprehension, and vocabulary.

Josefina was a fifth grade female student with an ELD level was 5. Her WCPM was 83, well below the benchmark goal. Her WID and WA were in the average range, 89 and 96 respectively. Her DAZE score was below benchmark, 17. Her PC score, 92, was in the average range. Both her PPVT and TVIP scores were 87, in the low average range. Josefina had difficulties with fluency and comprehension.

Esmeralda was a fifth grade female student. Her ELD level was 3. Her WCPM score was 104, below the benchmark goal. Her WID and WA scores were in the average range, 94 and 93 respectively. Her DAZE score was well below the benchmark goal, 10. Her PC score (89) was in the low average range. Her PPVT score was in the average range (90) as well as her TVIP score, 93. Esmeralda’s main difficulties were with comprehension.

Abigail was a fourth grade female student. Her ELD level was 4. Her WCPM score was below benchmark, 77. Here WID and WA scores were average (100 and 107 respectively). Her DAZE score was below benchmark, 11. Her PC was in the average range, 95. Her PPVT score was in the low average range (88). Her TVIP score was in the average range, 99. Her main reading difficulty was in vocabulary.

Valeria was a fifth grade female student. Her ELD level was 4. Her WCPM was below benchmark goal, 106. Her Word ID and WA scores were in the average range. Here DAZE score was well below benchmark, 6. Her PC was below average, 81, as
well as her PPVT score, 78, and TVIP score, 81. Valeria’s main difficulties were comprehension and vocabulary.

Lucas was a fifth grade male student. His ELD level was 3. His WCPM was 93. His WID and WA scores were average, 101 and 105 respectively. His DAZE score was below benchmark, 12. His PC score was in the low average range, 87. His PPVT score was below average, 83. His TVIP score was in the low average range, 86. Lucas’s main difficulties were in comprehension and vocabulary.

**Measures**

**Experimental vocabulary measure.** For this study, I developed a vocabulary measure containing the morphological elements taught during the intervention. Thus, the outcome measure for this study was at the lexical level, word meanings, for which morphological interventions have evidenced success for EO students (Bowers, Kirby, & Deacon, 2010).

**Selection of vocabulary words.** One critique of morphological intervention studies is that few studies include an explanation of the method used to select words (Carlisle, 2010). Since the goal of this study is to determine if an intervention in morphemic analysis would increase ELL’s ability to derive the meaning of unknown words, a procedure was needed to select words for instruction and assessment that would result in a battery of words unlikely to be known by the students. To accomplish this, a multiple step procedure was used. First, words from Coxhead’s Academic Word List (AWL; 2000) level four and above were selected to ensure that the words taught would be of academic utility and of low frequency. As Carlisle (2003) pointed out, high
frequency, morphologically complex words may be stored as whole words (single morphemes). Thus, low frequency words were chosen to increase the likelihood that students would use morphological analysis to determine word meanings. Next, derivational forms for these words were found in Merriam-Webster’s unabridged dictionary. The words from AWL were cross-referenced with Biemiller’s list of words for teaching from *Words Worth Teaching* (Biemiller, 2009). This list is organized by words students at various grade levels know commonly. T2 words are words that are known by 40 to 80% by students at the end of second grade. T6 words are words known by 40 to 80% of students at the end of sixth grade. D words are difficult words. E words are easy words. Some of the words included in the AWL already have derived forms. In these cases the base word and additional derived forms were identified.

Once identified, words were classified by type of derivational suffix. These categories were examined to ensure that sufficient words were included in both instruction and assessment (daily assessment for words taught and a transfer assessment, which contained words in which the base and suffix were taught, but the word in that actual form was not included in instruction).

To ensure balance in the frequency of words selected for instruction and assessment, the Carrol et al. (1971) word frequency list was used. To ensure balance, a block design was employed. First, the frequency of words selected for instruction was referenced in the word frequency list. Next, words were blocked according to the *U* value from the frequency list. From these blocked lists, words were randomly selected for inclusion in the daily assessments (see Appendix A for samples).
For this study, I decided to use words with derivational suffixes. Prefixes are more transparent in meaning, while the meaning of words with derivational suffixes are more difficult to determine, posing greater challenges for students with reading difficulties, as well as being appropriate instructional focus for upper elementary students (White et al., 1989). Derivational suffixes were chosen instead of inflectional suffixes because these may change the meaning of words (the target of this intervention) while inflectional endings do not. In addition, as noted above in the literature review, MA of derivational suffixes explained variance in vocabulary and comprehension and differentiated between poor and good comprehenders (Tong et al., 2013). Words were chosen on the basis of being infrequent, compared to other words. Students would then have to rely on morphological analysis rather than relying on stored meanings of words. If students are able to determine the meanings of untaught words with derivational suffixes, the study would have greater educational implications than if students can understand words with inflected endings. Following Carlisle’s (2010) recommendation, base words and the morphemes instructed are included in Appendix B.

**Design of the vocabulary measure.** To benefit reading comprehension, students need to be able to recognize the meaning of words contained in text. Thus, a measure of receptive, rather than productive, vocabulary was designed. The vocabulary measure consisted of a multiple-choice task, containing ten morphologically complex words and four answer choices for each word. One choice was correct, containing the morphemic elements of the word. Three choices were incorrect. One contained the meaning of the base word, but incorrect meaning of the suffix. Another contained the correct meaning of
the suffix, but incorrect base word meaning. The final choice was completely incorrect, neither the base nor suffix meanings were correct. The order of correct and incorrect choices was randomized. Appendix B contains a sample of the assessment.

**Descriptive Measures.** For descriptive purposes, other measures were administered to assess word reading, fluency, vocabulary, and comprehension. Students’ language proficiency level was determined by their current ELD level and the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997).

**Word Reading.** The Word Identification subtest of the Woodcock-Johnson-III Test of Achievement (WJ-III, Woodcock, Mather, & McGrew, 2001) measures a student’s ability to read words. Students are shown words that decrease in frequency as the student progresses. According to the Examiner’s Manual (Mather & Woodcock, 2001) the Letter-Word Identification subtest has a median reliability of 0.91 for children aged five to nineteen years.

The Word Attack subtest of the WJ-III measures a student’s ability to apply knowledge of phonics to read nonsense words. The word list becomes increasingly complex as students progress. The reported median reliability is 0.77 for students aged five to nineteen years.

**Fluency.** Students’ scores on the DIBELS Oral Reading Fluency (Good, et al., 2012) measure were used to determine students’ ability to quickly and accurately read words in connected text. Students are presented a passage and read for one minute. The number of words read correctly in one minute provides the WCPM score. Three passages are read. The median score is the WCPM. Dividing the median words correct
by the median words correct plus median number of errors provides an accuracy score. The reported alternate form reliability is 0.96 for fourth grade and 0.95 for fifth grade.

_Vocabulary._ Two vocabulary measures were administered. The Peabody Picture Vocabulary Test, third edition, (PPVT-III; Dunn & Dunn, 1997) is a measure of receptive English vocabulary. Students are given a word orally and asked to point to one of four pictures that best represents the meaning of the word. The alternative form reliability is 0.91 for children aged ten years. The PPVT-III will be administered to supplement the ELD level as a measure of English language proficiency. As the ELD levels are based on the California English Language Development Test, the PPVT-III will be administered for comparability to ELLs in other states.

The Test de Vocabulario en Imágenes Peabody: Adaptación Hispanoamericana (Dunn, Padilla, Lugo, & Dunn, 1986) is a receptive measure of vocabulary knowledge in Spanish, containing 125 translated items from the PPVT. Students are presented with a word stimulus orally and four pictures. Students choose the picture that best represents the word. The reported median reliability for ages 2–17 is 0.93.

_Comprehension._ Two comprehension measures were administered. For the DAZE subtest of _DIBELS_, students are provided a passage with approximately every seventh word replaced by a box in which students must circle the correct word of three choices to fit the context of the sentence. Students are given three minutes to read and answer as many choices as possible. The test yields the number of correct word choices, incorrect, and an adjusted score, which accounts for the probability of student guessing. The alternate form reliability for DAZE is 0.86 for fourth grade and 0.74 for fifth grade.
In addition, the DAZE Progress Monitoring assessment will be administered weekly during the intervention as a concurrent measure.

The Woodcock Johnson III Passage Comprehension subtest (Mather & Woodcock, 2001) requires students to view an illustration and/or read a short passage and supply a key word that fits the illustration or passage. Items become progressively difficult by removing the illustration and increasing the passage length, level of vocabulary, and complexity of sentence structure. The passage comprehension test has a reported median reliability of 0.83 for ages five to nineteen.

**Procedures**

**Experimental Design.** To investigate the research questions, a single case design (SCD) was employed, meeting the standards as established by What Works Clearinghouse (WWC; Kratochwill et al., 2010). This design is appropriate for initial investigations of the effectiveness of an intervention. Because of the nature of the study (students will be learning a skill that cannot be unlearned), a multiple baseline procedure was used. A multiple baseline design is appropriate for determining a causal, or “functional,” relation between the introduction of the intervention and the normal state (Kratochwill et al., 2010). In addition, a SCD allows a researcher to determine individual differences in response to the intervention. Thus, through the descriptive measures taken at the outset of the study, certain characteristics of students (such as word reading skill, ELD level, and comprehension level) were analyzed to compare students’ response to the intervention.
**Grouping.** Nine students were chosen, three fourth grade and six fifth grade students. Three students were assigned to one of three groups, A (David, Jasmin, & Abigail), B (Jaime, Josefina, & Valeria), and C (Aron, Esmeralda, & Lucas). The introduction of the intervention was staggered across the three groups as outlined below. Students were taught in these small groups of three.

**Prebaseline.** Prior to the beginning of the study, consented students were given the descriptive assessments as outlined above. In addition, students were administered the pre-vocabulary transfer assessment. This assessment contains morphological elements that were explicitly taught during the intervention. However, the words in these forms were not taught during the intervention. Students were re-administered the assessment post-intervention to determine whether students could generalize learning to untaught words.

**Baseline.** During the baseline phase students were administered the daily vocabulary assessment each session, containing ten words, which was completed independently. The target word and answer choices were read aloud as students read along. Performance on this assessment was recorded daily for each student. All three groups were administered the same daily vocabulary assessment whether they were in the baseline or intervention phase. Group A received this daily vocabulary assessment during the baseline phase until stability was reached over at least 5 sessions. Visual inspection was utilized to establish stability (see analysis below). This assessment established the baseline with which the results of the intervention phase were compared. Groups B and C continued in the baseline phase, receiving only the daily assessment,
until a functional relation was established for Group A, over at least three points, when the mean score of the intervention phase exceeded the mean score of the baseline phase. At this point, Group B began the intervention. Group C continued in the baseline phase until group B demonstrated a functional relation over at least three data points. Then, group C received the intervention. During baseline phase for all groups, students received typical classroom instruction.

**Intervention Phase.** During the intervention phase, students received explicit, direct instruction in morphological analysis strategies (see Appendices C and D for samples of a lesson and worksheet) for approximately fifteen minutes a day. This study used the fourth approach to MA interventions as describes by Carlisle et al. (2010) in the introduction, teaching students a strategy for determining the meaning of words using morphemes. During the initial lesson, students were presented a rationale for studying morphological units, explaining that they could use word parts to figure out the meaning of unknown words. Next, students were presented a strategy for determining the meaning of words using word parts. The four steps included (1) read the word; (2) look for a suffix; (3) find the base word; and (4) say the meaning of the suffix first, then the base word. After this, the four suffix groups used for this study were presented on a chart with definitions (-er/-or, -tion/sion, -able/-ible, and –ive), explaining the meaning and role of the suffixes (e.g. changing a verb into an adjective) with students rehearsing the definition with me. Explaining the syntactical property of words was an area Nagy and Tyler (1990) identified for explicit instruction for struggling readers. Next, I reviewed the suffixes on cards. I pronounced the suffix (while pointing to it) and pointed out the
spelling, with students repeating the suffix and spellings. After this, I gave the meaning of the suffix with students repeating. Finally, I randomly chose suffixes, having participants read the suffix and give the meaning. Participants were given multiple opportunities to read the suffixes and give the meaning in order to increase students’ ability to map the meaning of the morpheme with its phonology (Carlisle, Stone, & Katz, 2001; Leong, 1989). Finally, the meaning of the suffix was reviewed.

After this, I explicitly taught students a strategy for deriving word meanings using morphological elements because knowledge of the meaning of morphemes is necessary, but insufficient (Carlisle et al., 2003). I modeled how to derive the meaning of a word by analyzing the word parts (suffix and base word) using the charted strategy. Students had a worksheet with which to follow along and practice the strategy. First, I read the word. Then, I found the suffix. Next, I found the base word. Finally, I determined the word’s meaning by saying the meaning of the suffix first, then the base word. I modeled the first four words after which I guided them in using the strategy. During this instruction, the meanings of base words were explicitly taught (Bowers & Kirby, 2010) by presenting a student friendly definition and giving examples of contexts to which the word applied (Beck, McKeown, Kucan, 2002). At the end of the session, the base words and suffixes were reviewed through orally matching a definition with the correct derived word. The session concluded with a review of the strategy.

For subsequent lessons, the charted strategy and suffixes were reviewed first. Then, students practiced reading and saying the meaning of the suffixes on cards. Next, students practiced using the word analysis strategy. I began by modeling the strategy for
a few words then gradually releasing responsibility. Over the course of the intervention sessions, students began to practice the strategy independently in the small group as they became more proficient. Corrective feedback was given throughout the lessons.

All four suffix groups were introduced in the first session. Students continued to receive the intervention until all ten lessons had been taught. The literature reviewed indicated that students had difficulty with less productive and transparent morphemes. Moreover, White et al. (1989) recommended teaching words that did not undergo spelling changes first. Therefore, the sequence of lessons began with words that had greater transparency (phonologically, orthographically, and semantically) and productivity. For example, the first sessions began with words, in which base words do not undergo spelling or pronunciation changes (e.g., *detect* → *detector*) and the meaning between the base word and derived form is transparent. Later sessions included words that underwent changes (for example, *transmit* → *transmission*).

Immediately after each intervention session, students were administered the daily vocabulary measure. Students’ scores were recorded and graphed. These graphed scores were used to determine when a functional relation had been achieved in order to begin the next group in the treatment phase and in the analysis.

**Generalization and maintenance.** Once a functional relation had been established during the intervention phase, students continued to receive the intervention until all sessions had been taught, after which they received the post-assessment (Form A), which contained taught morphological elements, but untaught word forms. This assessment was used to determine if students were able to generalize the skills learned to
novel words. Alternate forms (forms B and C) of this assessment were administered one and two weeks after the conclusion of the intervention to determine students’ ability to maintain skills learned. The words included in forms B and C contained untaught words as well. These forms were randomly assigned so that half of the students received form B first; the other half received form C first to account for an order effect. The inclusion of a measure documenting students’ ability to maintain and generalize learning is a key component for morphological awareness interventions, which is often lacking in studies (Carlisle, 2010).

**Concurrent measure.** For a concurrent measure, the DAZE Progress Monitoring Assessment was administered at 1-week intervals (every 5 sessions) after the study began. Thus, the first progress monitoring assessment was given to all students at session five. All students received the same assessment on the same day. Groups A and B received 3 progress monitoring assessments. Group C received 4 progress monitoring assessments due to the fact that the treatment was delayed for group C, and they participated longer in the study than the other two groups.

**Procedural integrity.** Procedural integrity was conducted by a recent graduate of the doctoral program in the School of Education at the University of California, Riverside on 30% of the sessions, which were videotaped for the rater. The rater used a checklist (see Appendix E) to determine whether the procedures as outlined in the lesson were met. Procedural integrity was 100%.

**Interassessor agreement.** Interassessor Agreement was conducted between the author of this study and a recent graduate of from the doctoral program in the School of
Education at the University of California, Riverside. To meet the standards of WWC, interassessor agreement was collected for each phase, for at least 20% of the sessions. The minimum threshold for interassessor agreement will be 80%, which was calculated by dividing the number of agreements by the number of agreements and disagreements, multiplied by 100. The interassessor agreement was 100%.

**Social validity.** To measure students’ perception of the intervention, a survey was given at the conclusion of the intervention (see Appendix F). Students were given three questions on a four point Likert-scale and two open-ended prompts. The statement of the three questions were read to the participants, and participants had to choose whether they agreed or disagreed with the statement, with 1 = strongly disagree, 2 = disagree, 3 = agree, and 4 = strongly agree.

**Classroom observations.** Students’ response to the intervention may be influenced by the quality of vocabulary instruction that occurs during language arts instruction in the general education classroom. Therefore, language arts instruction for students included in the intervention was observed. Each teacher was observed for two hours for a total of 6 hours (360 minutes) of observations. At 1-minute intervals, what was occurring during the lesson was recorded. These recordings were then analyzed and coded for area: (a) reading (comprehension or text reading), (b) writing (spelling or composition skills), and (c) vocabulary (explanation, processing, looking-up in a dictionary, context clues, or morphological instruction), and (d) other (i.e. transition between activities) and who was performing the action (teacher or student). For non-vocabulary instruction, approximately 20% of the 1-minute interval observations were
teacher or students reading text, 44% were comprehension activities (teacher=14%; students=30%), 10% were writing, and 7% were other activities (for example transitions).

Vocabulary was recorded for approximately 19% of the observations. Of these vocabulary observations, 44% were teachers giving explanations of words, 54% were students engaged in a vocabulary activity (definition recording, sentence completion, and graphic organizer), and 1 occurrence of a student using a context clue to determine the meaning. There were no occurrences of teacher or students using morphemes to determine the meaning of words, even when opportunities presented themselves. For example, a teacher explained that a word was a noun because it was a place (focusing on its meaning) rather than identifying the –tion suffix (a morphological component). The observations did not record explicit instruction in using morphological elements to determine the meaning of words, which may have influenced participants’ progress during the intervention.

**Analysis**

**Visual analysis.** A visual analysis was conducted for each student following the guidelines established by WWC, which consists of four steps: (1) establishment of a stable baseline; (2) examination of within-phase patterns; (3) comparison of data between the baseline phase with data in the intervention phase in order to determine if there was an effect of the intervention by observing a change in the pattern of the data; and (4), integration of the information from all phases of the study to determine if there is an effect in the three intervention phases across the three groups.
Six variables as established by WWC were used to assess the patterns of change within- and between-phases: (a) level, (b) trend, (c) variability, (d) immediacy of effect, (e) overlap, and (f) consistency of data patterns across similar phases within each student and between the three groups of students (Kratochwill et al., 2010). Level is the mean score of the data within a phase. Trend refers to the slope of the data within the phase. Variability signifies the standard deviation around the slope. Comparing the last three data points of baseline with the first three data points of the intervention assess immediacy of the treatment effect. Because of the gradual introduction of morphemes, it was predicted that there would be a gradual effect that increases across sessions. Overlap refers to the number of data points in the treatment phase that overlap with the highest data point in the baseline phase. The method is known as PND, percentage of nonoverlapping data, and has been one of the most widely used methods for analyzing single case design studies for the past 25 years (Campbell, 2013). Results are reported for the percentage of data points in the treatment phase that do not overlap with the highest data point in the baseline phase. Following the suggestions of Scruggs and Mastropieri (1998), 90%–100% indicates the treatment was very effective, between 70% and 90% is effective, and below 70% not effective. Because this study is a multiple-baseline design, there are no repeated phases within each student as there would be in an A-B-A-B design, where after the treatment is withdrawn, a second baseline is introduced, then a second treatment phase is introduced (Kennedy, 2005). Thus, visual analysis did not compare consistency of similar phases within each student but across groups.
**Estimating effect size.** After the visual analysis, results of this study were supplemented by calculating an effect size (ES). Both methods are used because of lack of complete consensus in the literature as to which is the most appropriate method, although the PND method is the most widely used (Maggin & Chafouleas, 2013). Each method has its strength and limitations (see Scruggs & Mastropieri, 2013 and Campbell, 2013 for a current discussion). PND is consistent and reliable and has high interrater reliability and interpretability, whereas ES often lead to very large values and issues concerning autocorrelation due to the fact that scores are not independent from one another, leading to questions concerning its interpretability and validity (Scruggs & Mastropieri, 2013). On the other hand, PND is susceptible to outliers in the baseline phase and cannot discriminate sufficiently the magnitude of the effectiveness of a treatment with similar PND scores (Campbell, 2013). While this issue of appropriate method to determine effectiveness is generally a concern for study syntheses, it also has implications for individual studies. For if a student has an outlier in the baseline phase, using PND may not find the intervention as effective for that student. Therefore, ES were calculated to supplement PND to determine effectiveness.

To address the concerns regarding the interpretability of ES for single-case design studies, ES were calculated using the corrections as reported in Swanson & Sachse-Lee (2000). First, the difference between the mean of the treatment phase and baseline phase was determined. In this study, since there was a minimum of five data points in the baseline phase, the mean of the last five data points for both the baseline and treatment phases for each participant were calculated. Next, the standard deviation was determined
by first calculating the pooled standard deviation of the treatment and baseline phases. After this, an additional step was taken to account for autocorrelation. Because the same individual is being assessed, the standard deviation in repeated measure studies is often smaller than the standard deviation of pre-/post-test comparison designs (Rosenthal, 1994), leading to larger effect size estimates in repeated measures studies. To account for this autocorrelation, the standard deviation for the baseline and treatment phases was converted using the formula $S_p = S_g / \sqrt{2(1-r)}$, where $S_g$ = pooled standard deviation of the baseline and treatment phases and $r$ is the baseline and treatment correlation (see Rosenthal, 1994). To estimate the effect size, the difference between the mean of the treatment and baseline phases were divided this corrected standard deviation.

The analysis concludes with the results of the pre-/post-vocabulary assessment, generalization and maintenance assessments, comprehension monitoring, and student survey.

Chapter 4: Results

Baseline Performance

Results for each student are provided in Tables 2, 3, and 4 and Figure 1. Group A received five baseline sessions; group B received eight baseline sessions; group C received 11 baseline sessions. A relatively stable baseline was achieved for each student, although there was some variation. Five students (Jaime, Valeria, Aron, Esmeralda & Lucas) had flat baselines; two students (David & Josephina) had slight upwards trends; two students (Jasmin & Abigail) had slight downward trends. Furthermore, there was relatively low variability in the baseline. Three students (Jasmin, Abigail, & Jaime) had
more variability than the other students due to each having one data point that was higher than the other data points in the baseline phase. However, there was not high variability in the baseline phase, and the observed performance can be used to extrapolate students’ expected performance (Kratochwill et al., 2010).

Table 2

<table>
<thead>
<tr>
<th>Participant</th>
<th>Level</th>
<th>Trend</th>
<th>Immediacy*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BL</td>
<td>TRT</td>
<td>BL</td>
</tr>
<tr>
<td>David</td>
<td>3.00</td>
<td>8.0</td>
<td>0.20</td>
</tr>
<tr>
<td>Jasmin</td>
<td>1.00</td>
<td>8.6</td>
<td>-0.20</td>
</tr>
<tr>
<td>Abigail</td>
<td>4.40</td>
<td>8.1</td>
<td>-0.20</td>
</tr>
<tr>
<td>Jaime</td>
<td>2.75</td>
<td>8.2</td>
<td>0.12</td>
</tr>
<tr>
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<td>2.50</td>
<td>8.7</td>
<td>0.20</td>
</tr>
<tr>
<td>Valeria</td>
<td>3.13</td>
<td>8.9</td>
<td>0.04</td>
</tr>
<tr>
<td>Aron</td>
<td>3.10</td>
<td>8.3</td>
<td>-0.05</td>
</tr>
<tr>
<td>Esmeralda</td>
<td>4.27</td>
<td>8.5</td>
<td>0.12</td>
</tr>
<tr>
<td>Lucas</td>
<td>2.45</td>
<td>6.90</td>
<td>0.00</td>
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<table>
<thead>
<tr>
<th>Level</th>
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<th>Immediacy*</th>
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<tr>
<td>7.22</td>
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<td>90%</td>
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<tr>
<td>7.56</td>
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<td>7.67</td>
<td>90%</td>
</tr>
<tr>
<td>2.79</td>
<td>7.67</td>
<td>100%</td>
</tr>
<tr>
<td>4.67</td>
<td>6.33</td>
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</tr>
<tr>
<td>5.00</td>
<td>5.00</td>
<td>90%</td>
</tr>
</tbody>
</table>

Note. * For immediacy, BL = level of last three data points; TRT = level of first three data points. BL = baseline phase; TRT = treatment phase.

**Intervention Performance**

All groups received ten intervention sessions. Group A began the intervention at session six. The mean of the first three intervention data points for group A (7.22) was higher than the mean of the baseline phase (2.8). Therefore, group B began the intervention phase at session nine. The mean of the first three data points for group B (7.56) was higher than the mean of the baseline phase (2.79). Thus, group C began the intervention phase at session 12.

Visual analysis revealed all students increased their vocabulary scores during treatment phase. The level of the treatment phase increased compared to the level of the baseline phase with an average growth of 5.29 vocabulary words correct and a range of 3.7 to 7.6.
Jasmin showed the greatest growth in level between the intervention and baseline phases, from 1 to 8.6 vocabulary words correct. While she had average decoding skills, she had low average comprehension and vocabulary scores on the descriptive assessments. Abigail had the lowest growth. She increased her level from 4.4 in the baseline phase to 8.6 in the treatment phase. She too had average decoding skills and low average vocabulary, but average comprehension on the descriptive measures. However, there was not a trend of average comprehension predicting growth in level between phases, as Aron had average comprehension, but is level growth was in the mid-range (5.2).

Visual analysis also demonstrated a positive trend for all students and relatively low variability in the treatment phase. For David and Abigail, there was greater variability compared to the other students. However, as the intervention phase continued, the variability diminished. In addition, all students demonstrated an immediate effect of the treatment. The average for the difference between the first three data points of the intervention phase and the last three data points of the baseline phase was 4.2 with a range of 1.7 to 6.3. Esmeralda had the lowest immediate effect score. Initially she had difficulty with applying the new skill. But as the intervention continued, she steadily increased her scores.

In addition to level, trend, variability, and immediacy, for multiple baseline designs, it is necessary to compare across phases to determine if an effect demonstrated in the intervention phase is associated with an effect in groups still in the baseline phases (Kratochwill et al., 2010). Group A began the intervention phase at sessions six, seven, and eight. Groups B and C did not show a similar effect. Group B began the intervention
phase in sessions nine, ten, and eleven. Group C did not show an effect over these sessions. These results support a functional relation between the intervention and outcome measure.

The percentage of nonoverlapping data (PND) and effect size were used to determine the effectiveness of the intervention (see Table 2). Overall, PND showed that the intervention was very effective for eight out of nine participants. Five participants (Jasmin, Jaime, Josefina, Aron, & Emeralda) had 100% PND; three students (David, Valeria, & Lucas) had 90% PND. Abigail had 60% PND. Effect size also support that the intervention was effective. Effect sizes ranged from 1.83 to 1.96. This study illustrates an issue when determining the effectiveness of an intervention in single-case design studies. Abigail scored seven words correct at the second session during the baseline. This score is greater than her average without this data point, 3.75. However, her effect size score, albeit lower than the other participants, suggests that the intervention was instrumental in improving her words correct scores. Thus, it is important to include other ways of determining effectiveness rather than relying solely on PND. As can be seen from her generalization and maintenance scores, Abigail demonstrated an increase from the pre-assessment to the post-assessments.
Figure 1. Vocabulary Words Correct per Session

Note. Pre = vocabulary pre-assessment; Post = vocabulary post-assessment; Mnt = maintenance assessments, given 1-week and 2-weeks after the conclusion of the intervention.
Generalization and Maintenance

Students were administered pre-/post- and maintenance assessments (see Table 3). All students showed an increase on their post-assessment scores. For example, Josefina scored zero correct on the pre-assessment, but 10 correct on the post-assessment, as well as 10 correct at 1- and 2-weeks after the conclusion of the intervention. Jaime, Aron, and Lucas demonstrated the lowest growth on the pre-/post-assessment, but scored higher on the maintenance phase. These students may have required more time to internalize learning to be able to generalize to novel words. Valeria demonstrated a decline at the 2-week maintenance assessment, although this score was higher than her pre-assessment. This finding may be due to the fact that Valeria had below average scores on the comprehension and vocabulary descriptive assessments. Students with very low vocabulary and comprehension may require continued intervention in order to maintain and internalize the skills learned.

Table 3

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pre</th>
<th>Post</th>
<th>Maint 1</th>
<th>Maint 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>3</td>
<td>8</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>Jasmin</td>
<td>2</td>
<td>9</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Abigail</td>
<td>3</td>
<td>9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Jaime</td>
<td>3</td>
<td>5</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>Josefina</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Valeria</td>
<td>2</td>
<td>9</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Aron</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Esmeralda</td>
<td>5</td>
<td>10</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Lucas</td>
<td>2</td>
<td>6</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

Mean (SD) 
2.55 (1.33) 8.00 (1.87) 9.11 (0.93) 8.11 (1.83)

Note. Pre = vocabulary pre-assessment; Vocab Post=vocabulary post-assessment; Vocab Maint 1=vocabulary maintenance 1 assessment, administered 1 week after the conclusion of the intervention; Vocab Maint 2=Vocabulary Maintenance 2 Assessment administered 2 weeks after the conclusion of the intervention. These assessments consisted of base words and suffixes taught during the intervention, but not in the form that appeared on the assessment. SD = Standard Deviation.
Comprehension Monitoring

The DIBELS DAZE Progress Monitoring Assessment, given as a concurrent measure every five sessions, was administered to determine if there might be an affect on comprehension (see Table 4). Groups A and B completed 3 PM assessments; group C completed 4. Results were mixed for the students. Four students showed improvement, the remaining either made marginal to no gain or decline. Thus, there appeared to be no consistent growth on this measure during this study. This is not unexpected given that in the literature review (c.f. McCutchen & Logan, 2008, 2009, 2011) MA showed primarily an indirect affect on comprehension through vocabulary and other studies did not find an immediate affect on comprehension (c.f. Bowers, Kiry, & Deacon, 2010), even when the passage contained words that were the target of instruction (Baumann et al., 2002).

Table 4
DIBELS DAZE Benchmark (BM) & Progress Monitoring (PM) Assessment Results

<table>
<thead>
<tr>
<th>Participant</th>
<th>BM</th>
<th>PM1</th>
<th>PM2</th>
<th>PM3</th>
<th>PM4</th>
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<tbody>
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<td>David</td>
<td>10</td>
<td>9</td>
<td>14a</td>
<td>12</td>
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<tr>
<td>Jasmin</td>
<td>10</td>
<td>9</td>
<td>12a</td>
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<tr>
<td>Abigail</td>
<td>11</td>
<td>13</td>
<td>17a</td>
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<td>Jaime</td>
<td>11</td>
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<tr>
<td>Josefinia</td>
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<td>18a</td>
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<td></td>
</tr>
<tr>
<td>Valeria</td>
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<td>22</td>
<td>23a</td>
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<tr>
<td>Aron</td>
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<td>Esmeralda</td>
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<td>16a</td>
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<tr>
<td>Lucas</td>
<td>12</td>
<td>16</td>
<td>12</td>
<td>16a</td>
<td>18</td>
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</table>

*Note. a First progress monitoring assessment given after intervention began.*
Social Validity

Students’ responses on the survey given at the end of the intervention were positive (see table 5). The mean responses for questions 1, 2, and 3 were 3.67, 3.78, and 3, respectively. Two students responded with a 2 (disagree) to question 3 (“I can use word parts to find the meanings of words when I am reading at home or at school.”). This may indicate that the intervention should make the applicability of the strategy outside of the intervention setting more explicit. The open-ended questions were positive as well. Students indicated that the intervention had helped them. In response to the prompt “What I liked best about the lessons using word parts is”, one student wrote, “that is really helps my fugering the words out.” Another wrote, “leaning is fun.” Thus, overall, student responses indicated that they viewed the strategy of using morphemes to find the meaning of words as important to their learning and that they can use this strategy while reading to help them understand. On a side note, to the language of the prompt “using word parts,” one student responded, “Oh, you mean suffixes?”

Table 5

<table>
<thead>
<tr>
<th>Participant</th>
<th>Q 1</th>
<th>Q 2</th>
<th>Q 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>David</td>
<td>3</td>
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<td>2</td>
</tr>
<tr>
<td>Jasmin</td>
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<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Abigail</td>
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<td>4</td>
<td>2</td>
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<tr>
<td>Jaime</td>
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<tr>
<td>Esmeralda</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Lucas</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Mean (SD) | 3.67 (0.50) | 3.78 (0.44) | 3.00 (0.71)

Note. Q = questions; SD = standard deviation.
Chapter 5: Discussion

Participants’ Response to the Intervention

The goal of this study was to determine whether teaching ELL struggling readers a morphological analysis strategy would have an effect on their ability to find word meanings. In answer to the first research question, whether an intervention teaching a morphological analysis strategy would increase the ability of ELL struggling readers to derive word meanings, results from the visual analysis and effect size calculations established a functional relation between the intervention and an increase in their score on the daily vocabulary measures, which contained morphologically complex words. There may be several reasons for this. As suggested by Berninger and colleagues (2010) and Carlisle and Flemming (2003), MA alone may be insufficient for students to derive word meanings; students need explicit instruction in how to use morphemes to find word meanings. Moreover, struggling readers may have limited exposure to the syntactic role of words compared to typically developing readers due to differences in the amount of reading between these two groups, inhibiting poor reader’s ability to derive word meanings (Tyler & Nagy, 1990). Thus, struggling readers may require explicit instruction in morphemes and their syntactic properties. In this study, students received instruction in both the meaning of morphemes and how to use this knowledge to find the meaning of words, with the result that their vocabulary scores improved.

In answer to the second research question, whether some students might benefit from the intervention and other students might not based on background characteristics, the results suggested that all participants benefited from the intervention regardless of
background characteristics. The level of the treatment phase was higher than the baseline phase for all students. The trend was noticeably steeper for all students except one. However, for this student, Josefina, the trend was not as steep because of how much she improved. Examining her graph, for nine out of the ten data points, she scored 9s and 10s.

The treatment had an immediate effect for all students. The average difference between the last three data points of the baseline phase and the first three data points of the treatment phase was 4.18. One student, Esmeralda, did not demonstrate as strong an immediate effect as the other students. Her first data point score of the treatment phase (4) was equal to her scores on the last two baseline phase data. However, her next two treatment data points were higher (8 and 7) and she maintained higher scores (9 and 10) for the duration of the study. One explanation for Esmeralda’s pattern might be that as students first begin to learn the morphological strategy, they experience confusion in applying what they have learned to the assessment. As an anecdote, once the treatment phase began, students circled the suffixes and underlined the base words on the daily vocabulary assessment, suggesting that they began to attend to the morphemes on the assessment. Students were not instructed to circle suffixes or underline base words on the assessment in either the baseline or treatment phases. Overall, this finding is important because within three sessions of the morphological analysis training, students made increases on their scores on the daily vocabulary assessments.

Little overlap occurred between treatment phase data points and baseline phase data points. For the nine students of this study, five had 100% PND, three had 90%
PND, and one had 60% PND. According to these guidelines, the treatment was very
effective for eight of the nine students and not effective for the one. Abigail had a 60%
PND. She had the highest level score for the baseline phase due in part to the fact that
she scored seven correct on session 2, leading to overlap with four data points in the
intervention phase. This score could have been an outlier; the other baseline scores were
4, 3, 3, and 5 and the other intervention phases scores were 8, 9s, and 10s. The visual
analysis of the level, trend and immediacy and effect size suggest that Abigail benefitted
from the intervention. Abigail’s results may be an example of a limitation of PND as
pointed out by Campbell (2013).

Effect size results provide additional support that the intervention was beneficial.
ES ranged from 1.83 to 1.98 (mean = 1.90; standard deviation = 0.05). Thus, utilizing
both methods provide support that the intervention was effective for most participants.

On a separate note, Scruggs and Mastropieri (2013) raised the issue of inflated
effect size due to autocorrelation in single-case design studies. This study used a
correction for this autocorrelation. Effect sizes were still high in comparison to group
design studies; however, the type of assessment administered may have generated the
larger effect sizes. The daily vocabulary assessments were researcher created. In meta-
analyses of group design studies, it has been noted that effect sizes are larger when
assessments are researcher created (c.f. Edmonds et al., 2009). Thus, these large effect
sizes are in line with group comparison studies that employed researcher created
assessments.
Studies have found that morphological awareness begins to have a stronger, indirect role in reading development beginning around fourth grade, with stronger roles for fifth than fourth grade students (c.f. Deacon & Kirby, 2004). However, these studies were correlational and did not investigate whether ELL struggling readers might benefit from morphological analysis training. I predicted that all students would benefit similarly to explicit morphological analysis training, regardless of grade-level. Results from this study indicate that the intervention was effective for both fourth and fifth grade students, which was supported by the visual analysis and effect size calculation.

In addition, students had varying reading and vocabulary skills. Some students struggled with fluency, others with comprehension or vocabulary. Still others had difficulties with all three. For example, Aron’s main difficulty was fluency; Valeria’s main difficulties were comprehension and vocabulary; Jaime was lowest on word reading and comprehension; Lucas and David had difficulties with fluency, comprehension, and vocabulary. Finally, students ranged in their home language vocabulary knowledge (Spanish) from below average to average. Yet despite these different reading profiles, the visual analysis and ES suggest that the intervention was effective across student characteristics.

An exciting finding was that students generalized the morphological analysis strategy to untaught words. All participants improved on the post-assessment and maintained improved scores one and two weeks after the conclusion of the intervention, although three students’ Week-2 scores dropped. However, these scores were still higher than the pre-assessment. That students were able to increase their scores on this
assessment is promising for, although morphemes of these words (base word and suffixes) were taught during the intervention, these actual words were not instructed. Thus, they had to rely on what they had learned during the intervention in order to determine the words’ meanings, suggesting that the students generalized the strategy to novel words. This finding contrasts with other studies. For example, Baumann et al. (2002) found participants’ ability to derive the meaning of transfer words was significant at immediate posttest, but not significant on a delayed measure. Bowers and Kirby (2010) found that the treatment group outperformed the alternate treatment group on words in which the base and affix were taught, but not in that particular form. In contrast, the treatment group did not outperform the control group on transfer words in which the affix but not the base word was taught. In this study I conducted, students were taught the base words and affixes for transfer words. This finding reaffirms Carlisle and Flemings’ (2003) suggestion that students need instruction in the meanings of the morphemes (base words and affixes), as well as MA.

Vocabulary knowledge is necessary for comprehension (Gough & Tunmer, 1986). Studies indicated that MA is significantly related to vocabulary and indirectly to comprehension through vocabulary (c.f. Carlisle, 2000; McCutchen and colleagues, 2008, 2009, & 2011) and that MA may be a source of reading comprehension difficulties (Tong et al., 2013). This finding has been demonstrated for ELLs as well (c.f. Kieffer, 2013; Kieffer et al., 2008; Kieffer & Lesaux, 2012). The present study suggested that participants were able to use morphemes to derive the meaning of words, which may support comprehension in two ways. First, this strategy may increase vocabulary
knowledge in general, which would have an impact in overall comprehension. Second, this morphological analysis strategy would support students in having a strategy for figuring out the meaning of unknown words while reading a particular text, clarifying what they are reading and improving comprehension in real time for a particular text. Anglin (1993) found that as students progress to the upper elementary grades, the words of grade-level text become morphologically complex. Thus, students would have a strategy for determining the meaning of words that they may have never encountered before. This academic language (Nagy & Townsend, 2012) is necessary for comprehension. Thus, beyond increasing student’s vocabulary knowledge, morphological analysis strategy training may help improve reading comprehension.

**Instructional Implications**

Findings from this study have implications for vocabulary instruction, especially for ELLs who are struggling readers. First, the study showed improvement over a relatively short period of time. The visual analysis provided evidence that within three sessions, students improved in their ability to correctly identify the word meaning. Moreover, after the end of ten treatment sessions (approximately 2.5 hours), all students were scoring 8, 9, or 10 items correct. In Bowers and Kirby’s (2010) study, the strongest effects were found for studies that lasted 10–20 hours. This improvement in a relatively short amount of instructional time may be due to the limited number of base words (30) and morphemes (7) that were instructed. Yet, with targeted instruction, participating students demonstrated that they had learned the strategy and the content of the intervention. In addition, the length of the sessions was between 11 and 15 minutes,
which is important because the school day is already impacted by competing instructional demands, and 11 minutes of small group instruction maybe manageable, as well as meaningful. That an intervention of a relatively short duration and length can have an impact on improving student’s vocabulary knowledge makes implementing a morphological analysis strategy intervention feasible.

Second, the findings of this study indicate that a morphological analysis strategy intervention may begin as early as fourth grade. The intervention was effective for both fourth and fifth grade students. Intervening should not wait until students are older.

Third, this study found that the intervention was effective for all participating students, regardless of their background characteristics. Even students with below average vocabulary scores benefited from the intervention. As an example, Valeria’s standard score on the PPVT was 78, about 1.5 standard deviations below average; however, results indicated that the intervention was effective for her as well as for students with higher beginning levels of vocabulary knowledge. Therefore, choosing a morphological awareness strategy intervention need not depend on students’ English language proficiency.

This leads to the fourth implication: vocabulary instruction should contain instruction in affixes and base words. Lack of vocabulary knowledge is an issue for struggling ELLs readers. If students can be taught to derive meanings of unknown words using morphological analysis, they may increase their ability to determine the meanings of unknown words during independent reading (Anglin, 1993). This process may then increase vocabulary generally because more word learning occurs during independent
reading than can be explicitly taught through instruction (Nagy & Anderson, 1984). If students generalize morphemic knowledge to untaught words, teachers should devote time to explicitly teaching morphological analysis to complement classroom vocabulary instruction. This in turn could help to close the gap between high and low achieving students (Biemiller & Slonim, 2001) and give students a tool to understand the academic language of books (Nagy & Townsend, 2012).

From the review of studies in the introduction, vocabulary is clearly a deficit for ELLs, and MA is an important component of vocabulary and comprehension (Nunes, Bryant, & Barros, 2012). In particular, ELLs with reading difficulties have demonstrated even greater weaknesses in MA than their EO counterparts with reading difficulties (Kieffer, 2013). Thus, my results suggest that MA may be a fruitful area for specifically addressing the vocabulary weakness of ELLs with reading difficulties.

While this study indicated that participants were better able to determine the meaning of morphologically complex words, instruction during the intervention included the meaning of base words as well as suffixes, which Bowers and Kirby (2010) found to be essential for students whose language was English and did not have disabilities. It may be even more crucial for struggling learners, especially ELLs, to have explicit and targeted vocabulary instruction. During instruction, students were given a student friendly definition, examples and nonexamples of the words, and opportunities to process the words at deeper levels, such as to what context the word applies. To encourage the generalization students demonstrated in this study, teaching the meaning of base words
utilizing strategies such as those investigated by Beck, McKeown, and Kucan (2002 & 2008) may be necessary.

In addition, explicit strategy instruction may be needed. Students were not only taught the meaning of morphemes (base words and suffixes); students received explicit instruction in how to analyze the morphemes of a word, then synthesize this information in order to determine the word’s meaning. I did not test the three aspects of instruction separately—base words, suffixes, and a strategy for deriving meanings. It is possible that ELLs, especially those at risk for developing reading difficulties, need intensive, explicit instruction in base words and morphemes and a strategy for how using words parts to determine the meaning. Future studies could explore whether all three components are “active ingredients” in the effects of the intervention.

Finally, results of this study have implications for teacher preparation programs, professional development, and curriculum development. Participants were able to learn a morphological analysis strategy to derive the meanings of unknown words; however, teachers are rarely trained on how to teach morphological analysis. As with other elements of literacy instruction, teachers may not have the prerequisite knowledge of morphology to effectively teach students how to derive meanings from morphologically complex words (Moats, 1994). Teachers will need to be provided training in order to assist students in learning this strategy.

Limitations

A limitation of the study was the type of assessment used to measure students’ ability to determine the meaning of words using morphemes. Students were given a
multiple choice daily vocabulary measure. Because multiple-choice assessments introduce an element of chance, students could have guessed the correct answers. However, visual analysis found consistent results in the baseline and treatment phases. Thus, despite this element of chance, students still made consistent gains in the treatment phase compared to baseline phase, suggesting that the treatment lead to increases in the students’ scores. Other vocabulary measures might elucidate better students’ actual knowledge of the meaning of words than a multiple choice assessment, such as that employed by Beck and McKeown (2007) in which students had to determine whether a definition and context example matched a target word, or other measures of language production. This multiple choice assessment may have exhibited ceiling effects. Some students began to answer all questions correctly at the end of the intervention. Thus, this measure may underestimate participants’ knowledge gained from the intervention.

Future Research

This study found a functional relation between the morphological analysis strategy intervention and students’ performance on the vocabulary measure. Students were instructed in groups of three. Future studies could investigate group size. Might students in small groups of five benefit from the intervention? In addition, the study might be scaled up to determine whether students in a classroom setting might benefit from the intervention, employing a group comparison study.

Since the students in this study were fourth and fifth grade students, another area to explore is whether third grade students might also benefit from an intervention in morphological awareness training. Carlisle and Flemming (2003) found that third grade
students’ MA was related to vocabulary achievement two years later. Given this finding and the vocabulary knowledge gap that ELLs experience, it would be important to determine if morphological analysis training would be effective for younger students to begin to close the gap earlier.

Future research could investigate the effectiveness of combining morphological analysis training with context clue instruction for ELLs. Baumann, Edwards and colleagues (2002, 2003) found that instruction that combined morphology and context clues was effective for fifth grade students. However, they did not specifically investigate the intervention’s effectiveness for students of differing language proficiency. Future research could explore whether a combined morphological and context clue intervention could be more effective for ELLs than intervention in morphological strategy use alone.

Finally, another avenue to explore is the extent to which struggling ELL readers might benefit from an intervention that capitalizes on students’ home language. Many morphologically complex words are of Latin origin (Henry, 1989). For the ELLs in this study, Spanish, which is also based on Latin, was the home language. Nagy and colleagues (1993) found that only proficient ELL readers used knowledge of cognates to derive meanings of unknown words. Future research might include an intervention in which Spanish speaking ELLs are explicitly taught to use knowledge of their home language and morphological awareness to derive meaning of unknown words. We must continue to search for effective methods in order to give all students of our society an opportunity to learn and excel at school and in life.
References


Common Core State Standards (2012). *Common core state standards for English language arts & literacy in history/social studies, science, and technical subjects.*
Retrieved from
http://www.corestandards.org/assets/CCSSI_ELA%20Standards.pdf


Comparison of language skills, in phonology, morphology, and syntax.  
*Psychological Science*, 6, 149-156.


Appendices

Appendix A

Sample Vocabulary Assessment Items

1. expandable

   a. Someone or something that makes bigger (wrong suffix meaning).

   b. Able to be carried (wrong base word meaning).

   c. Someone or something that carries (incorrect).

   d. Able to be make bigger (correct choice).

2. detector

   a. someone or something that notices something (correct choice).

   b. someone or something that makes different (wrong base word meaning).

   c. the act of making different (incorrect choice).

   d. the act of noticing something (wrong suffix meaning).
Appendix B.

**Instructional Elements**

<table>
<thead>
<tr>
<th>Base Words</th>
<th>Morphemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>accommodate</td>
<td>-er</td>
</tr>
<tr>
<td>accumulate</td>
<td>-or</td>
</tr>
<tr>
<td>adapt</td>
<td>-tion</td>
</tr>
<tr>
<td>allocate</td>
<td>-sion</td>
</tr>
<tr>
<td>alter</td>
<td>-able</td>
</tr>
<tr>
<td>anticipate</td>
<td>-ible</td>
</tr>
<tr>
<td>communicate</td>
<td>-ive</td>
</tr>
<tr>
<td>confirm</td>
<td></td>
</tr>
<tr>
<td>converse</td>
<td></td>
</tr>
<tr>
<td>convert</td>
<td></td>
</tr>
<tr>
<td>depress</td>
<td></td>
</tr>
<tr>
<td>detect</td>
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<tr>
<td>expand</td>
<td></td>
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<tr>
<td>exploit</td>
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<tr>
<td>extract</td>
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<tr>
<td>inhibit</td>
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<tr>
<td>inspect</td>
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<tr>
<td>instruct</td>
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<tr>
<td>investigate</td>
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<tr>
<td>isolate</td>
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<td>manipulate</td>
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<td>predict</td>
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<td>promote</td>
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<td>reject</td>
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<td>restore</td>
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<td>submit</td>
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<tr>
<td>substitute</td>
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<tr>
<td>transform</td>
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<td>transmit</td>
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<tr>
<td>transport</td>
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</tbody>
</table>
Appendix C

Sample Word Analysis Scripted Lesson

**Materials:**
- chart of Morphological Analysis Strategy
- chart of suffix definitions
- cards with suffixes: -er, -or, -tion, -sion, -able, -ible, and -ive
- worksheet with words.

**Words:**
- **instruct:** instructor, instruction, instructible, instructive
- **adapt:** adapter, adaptable
- **convert:** convertive, convertible
- **detect:** detective, detectable
- **depress:** depressor, depressible
- **extract:** extractor, extractive

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Teacher</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>When reading, sometimes we might not know what a word means. When this happens, we can use parts of the word to help us find the meaning. For example, if we find the word fire place, we can use the word parts place and fire to figure out that a fireplace is a place to put a fire.</em></td>
<td><em>We are going to learn a strategy to help us find the meaning of words we don’t know.</em></td>
<td><em>[Reference posted chart.]</em></td>
</tr>
<tr>
<td><em>Here are the steps for our strategy.</em></td>
<td><em>First, read the word.</em></td>
<td><em>[Students repeat the strategy steps with the instructor.]</em></td>
</tr>
<tr>
<td><em>Second, look for a suffix.</em></td>
<td><em>Second, look for a suffix.</em></td>
<td></td>
</tr>
<tr>
<td><em>Third, find the base word.</em></td>
<td><em>Third, find the base word.</em></td>
<td></td>
</tr>
<tr>
<td><em>Fourth, say the meaning of the suffix then the base word.</em></td>
<td><em>Fourth, say the meaning of the suffix then the base word.</em></td>
<td></td>
</tr>
<tr>
<td><em>Repeat the steps with me.</em></td>
<td><em>[Students repeat the strategy steps with the instructor.]</em></td>
<td></td>
</tr>
<tr>
<td>[Have chart of suffix definition posted. Reference chart as instructing the suffix meanings.]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>In order to use word parts to find the meaning, we must know what the word parts mean.</em></td>
<td><em>We are going to learn four groups of suffixes. Suffixes are word parts that are added to the end of a base word and add meaning.</em></td>
<td></td>
</tr>
<tr>
<td><em>These two suffixes [point to -er, -or] are pronounced /er/ and mean someone or something that. It changes a</em></td>
<td><em>These two suffixes [point to -er, -or] are pronounced /er/ and mean someone or something that. It changes a</em></td>
<td></td>
</tr>
</tbody>
</table>
verb into a noun.

These two suffixes [point to -tion, -sion] are pronounced /shun/ and mean the act of. It changes a verb into a noun.

This suffix [point to -able] is pronounced /ubul/; this suffix [point to -ible] is pronounced /ibul/ and both mean able to. It changes a verb into an adjective.

This suffix [point to –ive] is pronounced /iv/ and describes something or someone related to. It changes a verb into an adjective.

Let us practice reading the suffixes.

Let us practice reading the suffixes.

Great you turn. [Randomly choose suffixes from the cards.]

[Modeling]

We can use our knowledge of these suffixes to read words and know what words mean. Watch me as I show you how to do this. Look at this word. [point to instructor on own worksheet for students to see. Check to see that students are following along on their worksheets.]

First, read the word. [Point to step 1 of strategy chart.]

Read it with me. /instructer/

[If students struggle reading the word, guide them to read each syllable with feedback.]

Now step 2, look for a suffix.

I see the suffix at the end [circles the suffix.] Circle the suffix on your sheet.

I pronounce this /er/. Pronounce it with me.

It means someone or something that [Reference suffix

[Students review the suffix meanings.]
What does it mean?

**Step 3, find the base word.** [Underline the base word.]

_Underline the base word on your sheet._

Now _instruct_ means to teach. For example right now I am instructing you. I am teaching you about suffixes. Who is someone else that instructs you at school?

So, _instruct_ means to teach.

**What does instruct mean?**

Now step 4, say the meaning of the suffix first, then the base word. So _instructor_ means someone or something that teaches.

**So let’s say the meaning of instructor together.**

_Instructor_ means someone or something that teaches.

**What does instructor mean?**

Excellent. See how we can use our knowledge of word parts to read and understand new words. Now let’s practice with some more words. We will follow the same steps: read the word; find and circle the suffix; underline the base word; then, say the meaning of the suffix and base word.

[Continue modeling procedures for first four words.]

**Guided Practice**

[During guided practice, teacher teaches the meaning of the base word then uses prompts to remind them of the steps in the strategy. Students use the strategy to find the meaning, with corrective feedback from the teacher.]

_**Our next base word is depress.** Read the base word with me. /depress/_.

Now _depress_ means to push down. For example, you need to depress a button to get the remote to work. What are some things you can depress?

So, now let’s look at our next word. What do we do first?

<table>
<thead>
<tr>
<th>Chart</th>
<th>Someone or something that teaches.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Students underline the base word on their sheet.]</td>
</tr>
<tr>
<td></td>
<td>[Students respond.]</td>
</tr>
<tr>
<td></td>
<td>to teach</td>
</tr>
<tr>
<td></td>
<td>Instructor means someone or something that teaches.</td>
</tr>
<tr>
<td></td>
<td>Someone or something that teaches.</td>
</tr>
<tr>
<td></td>
<td>[Continue modeling procedures for first four words.]</td>
</tr>
<tr>
<td></td>
<td>/depress/</td>
</tr>
<tr>
<td></td>
<td>[Students give examples.]</td>
</tr>
<tr>
<td></td>
<td>Read the word.</td>
</tr>
</tbody>
</table>
Good, read it.
Now what do we do?
Great. What suffix do you see?
Good, circle it. [Teacher circles suffix on own sheet.]
How do you read it?
What does it mean?
Now what do we do?
What’s the base word?
Underline it. [Teacher underlines base word on own sheet.]
What does it mean?
Finally, how to we find the meaning of the word?
So what does depressor mean?

[Continue guided practice with remaining words. Provide feedback on identifying base word and suffix, reading the base word, suffix, and whole word, and deriving the meaning of the word. As students become proficient with the strategy, gradually remove prompts leading students to independent practice.]

**Definition matching.**
[Teacher gives the definition, students supply the correct word.]

1. What word means someone or something that teaches?
   - **instructor**

2. What word means the act of changing to fit or work better?
   - **adaptation**

3. What word means able to change into something else?
   - **convertible**

4. What word means someone or something that notices something?
   - **detector**

5. What word means someone or something that pushes down?
   - **depressor**
6. What word describes something or someone related to pulling out?

[During the review, have students explain how they know which word belongs to the definition through analyzing word parts, providing corrective feedback on word analysis.]

<table>
<thead>
<tr>
<th>extractive</th>
</tr>
</thead>
</table>

Review.
Today we learned how to use word parts to determine the meaning of unknown words.

What are the steps in the strategy?

As you are reading, use this knowledge to determine the meaning of words.

[Students repeat the steps.]
Appendix D.
Sample Worksheet

Word Analysis Strategy Worksheet 1

Directions: Circle the suffix. Underline the base word. Say the meaning of the suffix then base word to determine the word’s meaning.

1. **instruct**: teach
   - instructor
   - instruction
   - instructible
   - instructive

2. **adapt**: change to make better
   - adapter
   - adaptable

3. **convert**: change into another thing
   - converive
   - convertible

4. **detect**: notice something
   - detective
   - detectable

5. **depress**: push down
   - depressor
   - depressible

6. **extract**: pull out
   - extractor
   - extractive
Appendix E.

*Procedural Integrity*

Procedural Integrity Checklist for Baseline Sessions

<table>
<thead>
<tr>
<th>Element</th>
<th>Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students completed daily vocabulary assessment.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Assessment consisted of ten words.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Teacher read the target words and answer choices to the students.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Students completed the assessment independently.</td>
<td>Yes / No</td>
</tr>
<tr>
<td><strong>Total number</strong></td>
<td><strong>Yes / 4</strong></td>
</tr>
</tbody>
</table>

Procedural Integrity Checklist for Intervention Phase

<table>
<thead>
<tr>
<th>Element</th>
<th>Met</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of suffixes chart posted.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Strategy chart posted.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Practice reading the suffixes on cards.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Practice reviewing suffixes’ meaning.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Introduction/review of Morphological Analysis Strategy</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Modeling/Guided and/or Independent practice how to derive the meaning of the word using morphemes.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Review of vocabulary through definition matching.</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Conclusion with review of morphemic analysis strategy.</td>
<td>Yes / No</td>
</tr>
<tr>
<td><strong>Total Number</strong></td>
<td><strong>Yes / 8</strong></td>
</tr>
</tbody>
</table>
Appendix F.

*Student Survey*

1. Understanding what words mean is important for my learning.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

2. I can use word parts to help me find the meaning of words I do not know.

<table>
<thead>
<tr>
<th></th>
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<th>3</th>
<th>4</th>
</tr>
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<tbody>
<tr>
<td></td>
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<td>Strongly Agree</td>
</tr>
</tbody>
</table>

3. I can use word parts to find the meaning of words when I am reading at school or at home.

<table>
<thead>
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<th>3</th>
<th>4</th>
</tr>
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<td>Strongly Agree</td>
</tr>
</tbody>
</table>

4. What I liked best about the lessons using word parts is __________.

5. One thing I would change about the lessons using word parts is __________.