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The Effects of Morpho-Phonemic and Whole Word Instruction on the Literacy Skills of Adult Struggling Readers

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THE EFFECTS OF

MORPHO-PHONEMIC AND WHOLE WORD INSTRUCTION

ON THE LITERACY SKILLS OF ADULT STRUGGLING READERS

by

SUSAN GRAY

A dissertation submitted to the Graduate Faculty in Speech-Language-Hearing Sciences
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THE CITY UNIVERSITY OF NEW YORK
Abstract

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Adviser: John L. Locke

This study investigated the effects of two kinds of word study on the literacy skills of 34 adult struggling readers. Young adults seeking high school equivalency diplomas were randomly assigned to intensive individual tutoring, two hours once a week for four weeks, in either morpho-phonemic or whole word study to learn academic vocabulary from a civics curriculum. Participants were African American and Latino adults in secondary education who had learned English either as their native language or as their second language in early childhood. Those given morpho-phonemic instruction analyzed Latin and Greek word origins, parsed morpheme and syllable structures, and extracted base words in morphologically related words. Those taught whole word study focused on spelling the words, reading additional sentence contexts with target words, and generating meaningful related words. Both groups made sizable gains on word reading, spelling, vocabulary and comprehension for the taught words, but the morpho-phonemic group had significantly higher gains on word analysis for extracting base words from complex words. Both groups demonstrated small gains in civics content knowledge that they studied. After the civics instruction, students projected large increases in their civic engagement, with an advantage for the whole word group.
The group who received morpho-phonemic tutoring transferred their learning from the vocabulary lessons to the reading of unfamiliar words, whereas the group who received whole word tutoring did not. To be specific, the group who learned to analyze words’ internal (sub-lexical) meaning and sound structures had significantly higher gain scores on standardized tests of word attack (reading nonsense words) and word recognition (reading words) than did the control group. These results are consistent with the hypothesis that teaching high quality lexical representations of words’ multi-dimensional linguistic identities, including how meaning and sound structures map onto spellings, increases literacy skills. The fact that these adult struggling readers increased their word attack and word recognition skills is noteworthy from a theoretical standpoint because being able to analyze and recognize new words are the first linguistic hurdles in the process of reading comprehension. In summary, teaching adult struggling readers to analyze complex words’ morpho-phonemic structures boosted their word reading skills with transfer to new words, whereas traditional whole word instruction did not, lending support to connectionist theories of written word learning.
This dissertation is dedicated to the ambitious people who participated in the study from the Adult Learning Center of Lehman College in the Bronx, New York City, who taught me as much about overcoming obstacles as I was able to teach them about literacy.
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Chapter 1

Introduction

Unlike spoken language, which typically develops without formal instruction, written language requires extensive instruction to achieve proficient literacy. Written language must be explicitly taught as it involves deciphering a complex linguistic code that maps spoken language structures onto their orthographic representations. Therefore, proficient literacy requires not only general linguistic awareness of how spoken language is represented in written form, but also specific awareness of words’ phonological, morphological, semantic, syntactic, prosodic and orthographic structures as well (Kavanaugh & Mattingly, 1974).

Failure to attain a proficient level of literacy threatens success in school, causing academic failure and, often, the decision to drop out. Nearly one quarter of all high school students in America drop out before earning a diploma (Edweek, 2013), many of whom have not attained proficient literacy skills (Perin, Flugman & Speigal, 2006). Underserved minority groups have the highest drop-out rates, with 32% of Latino and 38% of African American students leaving high school in 2010 (Edweek, 2013). Many who drop out have failed in school,
due to reading disabilities that arise from poor linguistic awareness. For example, developmental dyslexia, a reading disability characterized by poor word recognition, phonological and orthographic awareness (Lyon, Shaywitz & Shaywitz, 2003) affects 5-18 percent of the population (Interagency Committee on Learning Disabilities, 1987; S. Shaywitz, 1998) and is caused by a complex interaction of both familial factors (44-75%) and environmental factors (25-56%), such as poor written language instruction (Defries & Gillis, 1991). In a national survey of high school drop-outs, 35% percent attributed their decision to academic failure and 45% cited poor preparation from earlier schooling (Bridgeland, DiIulio & Morison, 2006). A study of adult education programs, including those catering to students in high school equivalency programs, found severe reading disabilities like dyslexia across all age groups (Perin et al., 2006).

Poor reading instruction, its associated academic failure and the drop-out epidemic have great societal costs that necessarily concern us. Most obvious are the costs to human and economic potential, as adults with low literacy skills who fail to earn high school diplomas find it difficult to survive in our information-based society without the essential skills to receive and convey written information. Poor reading skills limit adults’ opportunities for meaningful employment (Brown, Rocha, Sharkey, Hadley, Handley, & Kronley, 2005; Wayman, J. 2001) and upward mobility. Less obvious, though, is the fact that something else is in peril: the capacity for civic engagement, including the right to assume democratic responsibilities and to participate in democratic processes.

Young adults who have quit high school are much more likely than their economically advantaged peers to opt out, not only from high school, but also from democratic participation. Educational attainment is the best indicator of civic engagement (Niemi & Junn, 1998), and gaps
in educational attainment are highly predictive of the gaps in civic engagement, with high school dropouts being much less likely to become involved citizens. For example, the voting rate among dropouts is less than half the voting rate among people with advanced degrees (Coley & Sum, 2012). Moreover, the widening gaps in education and civic engagement reflect disparities in age and income levels. In a study considering the effects of age, education and income on voting behavior during the 2010 congressional elections, young high school dropouts who earned less than $20,000 per year were at the lowest end of the distribution, voting at a rate of only 3.5 percent (Coley & Sum, 2012). Beyond voting, civic engagement involves access to civic knowledge and participation in civic life, with large gaps between young African American and Hispanic adults and young white adults (Jacobson & Linkow, 2012). Urban minority young people have limited exposure to adult modeling of political participation, and fewer opportunities for civic learning and volunteering (Hart & Atkins, 2002).

Given the prevalence of low literacy skills in adults and the associated societal costs of school failure, few studies have investigated reading interventions for adult struggling readers (Kruidenier, 2002). In one promising study, researchers (Alamprese, MacArthur, Price & Knight, 2011) tailored adult literacy instruction to the morpho-phonemic structure of English whose orthography encodes both sound and meaning structures (Chomsky & Halle, 1968). In contrast to other studies that found minimal gain from adult literacy interventions (Greenberg, Wise, Morris, Fredrick, Rodrigo, Nanda, & Pae, H., 2011). Alamprese et al. (2011) found that adults made significant literacy gains after being taught to analyze words’ sound, meaning and spelling structures, and to use a metacognitive strategy for decoding complex words. Another group of researchers (Bhattacharya & Ehri, 2004) compared two kinds of literacy intervention for adolescent struggling readers, with positive results. Teens who were taught to analyze words’
grapho-syllabic structures made greater gains in word reading than did those who studied the whole words without syllable analysis.

Teaching adult struggling readers with late elementary to middle school reading skills to map words’ sound meaning and spelling structures is compatible with theories of reading and spelling development. Intermediate readers must shift from “learning to read” new words to “reading to learn” new information (Chall, 1983). Likewise, older spellers must transition from mapping single sounds to mapping larger linguistic units, like syllables and morphemes, to words’ spellings (Ehri, 1998).

Morpho-phonemic teaching for adults with poor literacy skills is also theoretically grounded in connectionist theories of word learning like the Lexical Quality Hypothesis, which posits that poor reading is the result of poor word knowledge (Perfetti & Hart, 2001, 2002). Unskilled readers do not make complete connections between words’ phonological, morphological and orthographic structures, resulting in underdeveloped mental representations of words, which compromise efficient reading and spelling of words. In turn, poor word reading and spelling obstructs access to higher level skills, including reading vocabulary and reading comprehension. Explicit teaching of the connections between complex words’ sound, meaning and spelling structures increases readers’ word knowledge, thereby facilitating literacy. Thus, teaching academic vocabulary, complex words taken from content area curricula, is one bridge to increasing word knowledge and literacy.

The present study contributes to research on adult literacy, both theoretical and practical, by investigating the effects of morpho-phonemic vocabulary teaching on the reading and language skills of adult struggling readers, as sampled in this population of young adults in secondary education, working toward their high school equivalency diplomas (General
Educational Development or GED certificates). This study considers vocabulary instruction within the framework of the Lexical Quality Hypothesis and extends the research of Alamprese, et al. (2011) and Bhattacharya & Ehri (2004) by comparing the effects of rich, in-depth word study with and without word analysis. The experimental condition teaches word analysis through morpho-phonemic parsing, whereas the control condition teaches whole words in multiple sentence and personally meaningful contexts. To motivate adults with low literacy skills, the current study offers relevant content area teaching by situating academic vocabulary instruction within civics passages on the rights and responsibilities of United States citizens.
Chapter 2

Literature Review

Reading Disabilities in Adult Secondary Education

Adults in secondary education often have reading skills below well below the early high school level, though they aspire to earning a high school equivalence diploma. In one study of urban GED students (Perin, Flugman & Spiegel, 2006), 32-52% read at levels that were below the fifth grade equivalency. According to those teachers and students interviewed for the study, up to 40% of the GED students that were 16-20 years old had had learning and attentional disabilities. Many students in adult education have severe reading disabilities that are consistent with dyslexia (Greenberg, 2011), a reading disability involving poor awareness of words’ sound structures reducing decoding and spelling skills (Stanovitch & Siegel, 1994) that persists through the lifespan (Bruck, 1992, Shaywitz et al., 1999). Adults with reading disabilities also tend to have poorly integrated reading component skills, performing better on word reading than on phonological tasks and decoding skills (Greenberg, Ehri & Perin, 1997; Sabatini, Sawaki, Shore & Scarborough, 2010). To be specific, adult struggling readers matched on word reading with typical 3rd to 5th graders performed better than the children on sight word reading, but much worse on tasks of decoding, sound deletion and phoneme segmentation, indicating severe phonological deficits in reading disabled adults (Greenberg, Ehri & Perin, 1997). Given the special educational needs of many adult struggling readers in high school equivalency programs, tutoring by literacy specialists trained to teach evidence-based strategies could be particularly effective. However, the current approach to GED classes typically involves large group
instruction by general educators (Perin et al., 2006; Kruidenier, 2002), though some do provide tutoring as well (Perin, Flugman & Speigel, 2006).

**The Effectiveness of Teaching Phonological and Morphological Awareness in Literacy**

Reading research with children and adolescents has established that poor decoding skills reflect poor phonological knowledge of words’ structures and that teaching phonological awareness, conscious awareness of words’ sound structures, leads to literacy gains in poor readers (National Reading Panel, 2000). Now there is a rapidly growing body of research showing the value of teaching morphological awareness, conscious awareness of words’ meaning structures or morphemes, including root words, prefixes and suffixes. This increased interest in how morphological teaching could increase literacy has produced three meta-analyses examining this kind of instruction (Bowers, Kirby & Deacon, 2010; Goodwin and Ahn, 2010, 2013) and two literature reviews (Carlisle, 2010; Reed, 2008). Despite this attention, more intervention research is needed to establish that morphological instruction actually causes literacy improvements (Bowers, Kirby & Deacon) especially for people with reading difficulties (Carlisle, Nagy & Goodwin, 2013).

Because English orthography is morpho-phonemic, with spellings that reflect its morphemes and phonemes, which are linguistic units of sound (Chomsky & Halle, 1968), all language can be analyzed at the morpho-phonemic level. Increasing awareness of words’ morphemic structures may lead to literacy improvements in myriad ways. Morphemes are the smallest units of meaning. They can be single phonemes (e.g., plural –s) or full stems (e.g., *cat*). Complex words consist of a stem plus grammatical morphemes (e.g., plural –s; agentive –er). Morphology has been defined as the study of “rules that govern the use of morphemes in a language” (Berko-Gleason & Bernstein Ratner, 2012, p. 401) but it interfaces with virtually all
components of language, including semantics, syntax and phonology. Consider how morphology interacts with phonology. Addition of a morpheme can lead to stress changes (e.g., *courage-* courageous) or morphological derivation can be accomplished solely via a stress change (e.g., *contract* as a noun and *contract* as a verb) or via vowel sound changes in derived forms (e.g., *serene-* serenity). In addition, morphology plays a major role in orthography, clarifying the spellings of seemingly irregular words through revealing the source of their silent letters within morphological relatives (e.g., bomb/ bombard) and the word origins of compound words (e.g., cupboard) (Chomsky, 1970). Given that morphemes reflect various semantic, phonological and orthographic properties, it is no wonder that readers’ knowledge of morphemes’ multiple roles facilitates decoding, word reading, word knowledge and reading comprehension (Carlisle, 2003).

Adult struggling readers, the population of interest in the current study, present with a wide range of reading skill levels including elementary, middle and high school levels. Knowledge of morphemes facilitates literacy at all levels of schooling with gradually increasing correlations between morphological awareness and literacy during the first to fourth grade years, precipitously increasing correlations from the fourth to middle school years, and reliably high correlations through the high school years.

In first graders, morphological awareness correlates highly with reading (Carlisle & Nomanbhoy, 1993) and spelling (Wolter, Wood & D’zatko, 2009), as it does for second and third graders as well (Fowler & Liberman, 1995). Early elementary students need to develop word recognition skills within an orthographic framework, to understand rules governing doubling of consonants (e.g., hop-hopping) dropping of the silent e (e.g., care-caring) and grammatical inflections (e.g., ing, ed, plural s suffixes) (Moats, 1995). In addition, elementary age children learn about derived forms, including the fact that base words create complex words (e.g., warm-
warmth) and complex words grow from base words (e.g., wamth- warm) (Berninger, Abbott, Nagy & Carlisle, 2010). They also show evidence of awareness of morphemes at the subtle prosodic level, as seven and eight year olds have increasing sensitivity to sound and stress changes within complex words with different suffixes (e.g., tion, ity and ic) (Jarmulowicz, 2006; Jarmulowicz, et al., 2007, 2008). Reaching a crescendo for fourth graders, morphological awareness correlates very highly with both vocabulary knowledge (r = .91) and reading comprehension (r = .86) (Wagner, Muse & Tannenbaum, 2007). Coinciding with increasing correlations between morphological awareness and literacy are increasing demands to read complex vocabulary in upper elementary school texts, about 60% of which is morphologically complex (Nagy & Anderson, 1984).

Students in middle school continue to develop literacy skills through syntactic knowledge and corresponding orthographic knowledge for morphologically complex words. Particularly challenging at these grades are the spellings of complex words in which the base word undergoes a change, or shift, when it is transformed into its complex derived form (Carlisle, 2003). Changes from the base word to its derived form can be transparent, involving only a morphological shift (e.g., grow-growth), or less transparent, involving both a morphological and a phonological change (e.g., heal-health) or fully opaque, involving a morphological, phonological and orthographic shift (e.g., five-fifth). Although middle school students still have difficulty pronouncing and spelling complex words with less transparent relationships between their base and derived forms, they show marked improvement spelling words with phonological shifts as they progress through the intermediate school years (Carlisle, 1988). They also demonstrate syntactic sensitivity, as they recognize syntactic categories signaled through oral and written presentation of suffixes attached to nouns (i.e., ion, ation, ity, and ist), verbs (i.e., ate, ize, and
ify) and adjectives (i.e., ous, ious, al, and ive). For example, sixth grade children chose with 90% accuracy which derived words best fit sentences, and chose with 75% accuracy which nonsense derived words best fit sentences (Singson, Mahony & Mann, 2000). Furthermore, intermediate readers apply their increasing syntactic and orthographic knowledge to word analysis, word recognition, reading vocabulary and reading comprehension skills, generalizing their knowledge of familiar morphemes to better read unfamiliar words, and to use morphemic clues to infer meanings of new words they encounter in sentences (Wysocki & Jenkins, 1987).

At the high school level, students continue to develop their morphological awareness in conjunction with their literacy skills to acquire fuller knowledge of the linguistic structures of English. At this age, they continue to show better performance on morphological tasks that involve recognition than they do on tasks requiring oral and written word production, suggesting that their knowledge of the syntactic and semantic functions of suffixed words is incomplete. They develop more specific knowledge of the meanings and spellings of Latin and Greek root words and affixes, leading to increased generalization of vocabulary. For example, many high school students had difficulty expressing the meaning of suffixes in a definition task (Henry, 2010; Nagy, Diakidoy & Anderson, 1993).

Typically, K-12 reading instruction does not include morphological teaching (Henry, 2003; Nunes & Bryant, 2006), despite mounting evidence that teaching morphemes improves literacy at all levels of schooling, especially for reading disabled students (Goodwin & Ahn, 2010; Bowers, Kirby & Deacon, 2010). Literacy outcomes seem to be particularly robust when morphemes are taught in conjunction with phonemic and orthographic aspects of words, as seen in one innovative reading intervention program developed for severely reading disabled children (Lovett, Lacerenza & Borden, 2000). Lovett and her colleagues (2000) developed a program that
instructs poor readers in phonological, morphological and orthographic attributes of words through work on decoding and meta-cognitive strategies for word identification. The program is called PHAST, for Phonological and Strategy Training Program. The coding part of the program teaches phonological analysis and blending through direct instruction, both oral and written, in letter-sound and letter cluster-sound correspondences. The word identification part teaches four meta-cognitive strategies 1) identifying words by analogy, 2) finding familiar word parts within the larger word, 3) trying various vowel pronunciations and 4) “peeling off” prefixes and suffixes from base words.

Frijters, Lovett, Sevcik and Morris (2013) studied the effects of the PHAST reading intervention program on the literacy skills of middle school struggling readers. The 270 participants were matched on their raw scores for the Woodcock Johnson III Word Attack and Letter Word Recognition and placed into small groups, which were randomly assigned to one of three types of reading intervention. Two experimental groups received similar variations of the PHAST program and one control group received the traditional special education instruction. Higher rates of gain were found for the groups who received the PHAST program than were found for the group who received the tradition special education program. Within those gains, PHAST recipients made greater gains on tasks measuring word level skills, including Word Attack and Letter Word Identification, than they did on tasks measuring multiple word level literacy, including Reading Comprehension and Reading Fluency.

Four reviews of the effects of morphological intervention on literacy found compelling results. The first review analyzed seven studies that met the criteria for teaching morphological knowledge between 1986 and 2006 and reported medium effect sizes on literacy, with greater effects from teaching root words and affixes than from simply teaching affixes alone (Reed,
Similarly, a meta-analysis examined 17 studies of morphological awareness in K-12th graders and found moderate treatment effect sizes for overall literacy, phonological awareness, morphological awareness and vocabulary, with smaller, but still significant, effect sizes for reading comprehension and spelling (Goodwin & Ahn, 2010). Serving as a kind of instructional guide to the benefits of teaching morphology, an integrative review of 16 morphological intervention studies reported that the power of morphological teaching lies in its ability to improve literacy, especially with regard to knowledge of morphemic structure, spelling and vocabulary (Carlisle, 2010).

In the fourth review of research on morphological instruction and literacy, Bowers, Kirby and Deacon (2010) report a comprehensive analysis using a unique coding system that elucidates the linguistic effects of morphological intervention on literacy. They included not only published studies, but also dissertations and studies from peer-reviewed conferences; not only English studies, but also studies conducted in other languages. For the 22 studies that met criteria for inclusion, researchers coded the outcomes according to the linguistic layer on which the instruction focused, participant characteristics, and other characteristics of the studies designs. Outcome measures from tasks that focused on teaching morphemes within words were assigned to the sub-lexical layer, those focused on teaching word level morphological knowledge were assigned to the lexical layer and those focused on instruction beyond the word level were assigned to the supra-lexical layer. In this way, intervention studies that taught morphemes in more isolated ways, at the within word and word levels, could be compared with other studies that taught them in more integrated ways, at the sentence and passage levels, within more comprehensive literacy instruction. This linguistic analysis revealed a consistent pattern of results. Instructional outcomes that focused on morphological teaching at the sub-lexical layer,
such as morphemic analysis of roots and affixes, produced medium to large average effect sizes ($d = .65$), whereas those that taught at the sub-lexical layer without use of morphemes produced smaller effect sizes ($d = .34$). Outcomes that focused on the lexical level, such as word identification, yielded medium average effect sizes ($d = .41$) and those that addressed the supra-lexical skills, such as reading comprehension, bore small average effect sizes ($d = .26$). Stronger effects of morphological teaching on literacy were also seen for readers who had poorer reading skills than their peers (Bowers, Kirby & Deacon, 2010). The authors’ findings supported their hypothesis that more explicit sub-lexical tasks would produce greater effect sizes because such tasks address literacy through direct, concentrated teaching of word structure, whereas less explicit supra-lexical tasks address literacy in less direct, more diffuse ways leading to smaller effect sizes.

To address the need for more research in adult literacy, three well-controlled reading intervention studies were recently carried out with adults, one of which reported promising results after morpho-phonemic teaching. One group of researchers studied the effects of four kinds of reading intervention on the literacy skills of adults reading at the third to sixth grade levels. The four kinds of instruction focused on teaching adults decoding, fluency, comprehension, extensive reading and a combination of those skills, but yielded only small treatment effect sizes on literacy measures (Greenberg et al., 2011). Another research team offered poor-reading adults three intervention programs that taught corrective reading, an approach combining reading with retrieval, vocabulary and spelling, and guided repeated reading. Adults reading below 7th grade levels made moderate improvements in decoding, small to moderate gains in reading fluency and modest gains in word identification, reading comprehension, sight word and phonological decoding (Sabatini, Sawaki, Shore & Scarborough,
The third group of researchers used a morpho-phonemic approach to increase reading skills of low to intermediate adult readers. Using a literacy intervention program based on Venezky’s study of English orthography (Venezky, 1999), adult readers were taught word analysis of phonemes, morphemes and their spellings, as well as a metacognitive strategy for decoding complex words. Those who received this structured approach made better gains in decoding than those in the control group, who were taught the regular adult literacy program using a children’s curriculum adapted for adult use. Both groups made small to moderate gains in word recognition and spelling (Alamprese, MacArthur, Price, & Knight, 2011).

**Developmental Reasons for Morpho-Phonemic Instruction in Adult Literacy**

Teaching morphemes and syllables to adults with late elementary, middle and high school level reading skills fits well with models of literacy development. According to reading stage theory, phoneme-grapheme decoding develops in early elementary grades, followed by a major shift in later grades, when reading comprehension becomes the main focus of development (Chall, 1983). Phonological awareness is crucial in early decoding (Ehri et al, 2001; Wagner & Torgeson, 1987), but during the late elementary shift from coding to meaning emphasis, the influence of phonological awareness on reading diminishes, while the impact of morphological awareness increases (Singson et al, 2000). Also during the code to meaning shift, readers’ vocabulary growth surges with the development of morphological problem-solving (Anglin, 1993), the reasoning of unknown words’ meanings based on known morphemes. In step with the developmental shift from code to meaning, written materials for students at the fourth grade and beyond contain mostly complex words with more than one morpheme (Nagy & Anderson, 1984). Morphological teaching at the intermediate stage is also supported by phase theories of decoding and spelling, as readers and spellers progress from learning alphabetic principles to
learning patterns within words, syllables and affixes, then derivational patterns (Ehri & McCormick, 1998; Templeton & Morris, 2000), and spelling evolves from semi-phonetic to phonetic and morphemic phases (Ehri, 1986).

Complementing the developmental shift from decoding to meaning, learners need to shift their understanding of English orthography from its surface phonetic structure to its deep lexical properties (Chomsky, 1970). Whereas young children spell words phonetically, older children learn “lexical spellings” that reveal connections between words’ pronunciations, spellings and meanings. Lexical spellings are especially useful when letter-sound correspondence is obscured in words whose pronunciation involves phonological changes from the base word to the derived form, as in courage, courageous (Chomsky, 1970). Literacy development may best be understood as progression along a continuum of meta-linguistic awareness as readers mature. Morphological awareness represents a more advanced level than phonological awareness (Seymour, 1997; Deacon & Kirby, 2004). Jarmulowicz et al. (2008) propose a developmental continuum of meta-linguistic awareness progressing from phonological to morphological to morpho-phonological awareness, based on their studies of children’s ability to pronounce prosodic stress alternations in suffixed words. Representing one of the highest levels of meta-linguistic awareness, morpho-phonological accuracy develops from readers’ awareness of how certain English suffixes affect phonological changes in pronunciation.

**Theoretical Reasons for Morpho-Phonemic Word Study**

Successful reading comprehension depends on successful word knowledge, which is achieved when readers have high quality spoken and written representations of words, or lexical representations, according to the Lexical Quality Hypothesis (Perfetti, 2007; Perfetti & Hart,
Two factors that determine the quality of lexical representations in the mental lexicon are specificity and redundancy. Specificity arises from making core connections between words’ phonological, semantic and orthographic structures. Readers attain high lexical quality for a word when they can read and understand it accurately, fluently and reliably. To do so, they must not only specify the word’s sound, meaning and spelling constituents fully, and in an integrated way such that these three constituents are bonded together, but they must also do so quickly or fluently. According to the Lexical Quality Hypothesis, there are five linguistic features that influence lexical quality. The first four features—orthography, phonology, grammar and meaning—are elements or constituents of word identity. The fifth feature, constituent binding, is the result of the first four elements or constituents being linked together or well specified. Thus, high quality lexical representations depend on both specificity, the extent to which their spelling, sound and meaning structures are precisely and fully represented, and redundancy, the extent to which those structures share overlapping linguistic clues, to facilitate word knowledge and make word identities predictable (Nagy, Carlisle & Goodwin, 2013).

In the Lexical Quality Hypothesis, Perfetti (2007) explains how proficient reading comprehension depends on high quality representations of words. In order for readers to comprehend passages, they must be able to read the words accurately and fluently. For unfamiliar words that are not already catalogued in their mental lexicon, readers must be able to analyze their sub-lexical structures in order to specify their sound, meaning and syntactic identities, and bind those identities to their spellings. This theory views proficient reading as a connected, nested process, in which reading comprehension depends on word recognition, which depends on word analysis, which depends on mapping of sound, meaning and spelling structures. Thus, the Lexical Quality Hypothesis encompasses all linguistic layers of literacy learning,
including the sub-lexical layer, the lexical layer and the supra-lexical layer, as described by Bowers, Kirby and Deacon (2010) in their comprehensive literature review of morphological interventions.

Like the Lexical Quality Hypothesis, other connectionist views of word learning offer theoretical bases for teaching morphological awareness to struggling adult readers. Ehri proposed a “word identity amalgamation theory” in which instant word recognition, or sight word reading, results from the melding of a word’s linguistic identities into one amalgamated orthographic image containing the fully-appointed phonological, syntactic and semantic identities (Ehri & Roberts, 1979; Ehri, 1992). In other words, readers learn to read words instantly, by sight, when they have amalgamated the spellings of word with their pronunciations and meanings in their mental lexicon. Like the Lexical Quality Hypothesis, the Amalgamation Theory of Sight Reading asserts that skilled readers are competent at binding words’ phonological and semantic identities to their orthographic identities, whereas unskilled readers lack proficiency in this skill.

Ehri further elaborates on word amalgamation by creating a developmental continuum with four phases of sight word recognition (Ehri, 1995a). In the pre-alphabetic phase, readers use logographic information to read words associatively, through their salient visual features and contexts such as guessing the printed word nest when it is accompanied by a picture of a nest. In the partial alphabetic phase, readers make incomplete connections between words’ spellings and pronunciations, as in reading net for nest. In the full alphabetic phase, readers make full mappings of words’ sound, meaning and spelling structures, to read simple words, like nest accurately. The highest phase of sight word reading is of most interest in the current study. At the consolidated phase, learners read words by sight as a result of forming connections between multi-letter units, including morphemes and syllables. When readers attain this level of sight
word development, they are able to make spelling, sound and meaning connections skillfully to read words that are polysyllabic and morphologically complex (Bhattacharya & Ehri, 2001), such as nesting or nestled.

**Teaching Academic Vocabulary as a Bridge to Literacy**

Learning morphologically complex words increases vocabulary knowledge, which is vital to school success and lack of that knowledge is consistently shown to hinder student achievement (Corson, 1997; Garcia, 1991; Snow & Kim, 2007). This is particularly true for students from low income urban settings and for those who learned English after learning another language. These students start school with lower vocabulary skills than their middle income, native English speaking peers (e.g., Cobo-Lewis, Pearson, Eilers, & Umbel, 2002; Hart & Risley, 1995) and this vocabulary disparity widens as students advance in age (Kieffer, 2008; Nakamoto, Lindsey, & Manis, 2007). To succeed in the language of schooling, or academic language, one must have knowledge of academic vocabulary, including words that are generally useful in school and those that are useful within specific subject disciplines (Nagy & Townsend, 2012).

Academic vocabulary words have certain characteristics. They are typically derived from Latin and Greek word origins and are morphologically complex. They contain predominantly nouns and adjectives and use grammatical metaphor, such as nominalizations in which verbs and adjectives are turned into nouns by adding suffixes (Townsend & Nagy, 2012). For example, the verb colonize can become the noun colonization; the verb fail can become the noun failure and the verb sing can become the gerund singing. Knowledge of academic vocabulary is crucial for those in secondary education, as they prepare for post-secondary education and meaningful lives after high school.
In 2008, a nonprofit organization called Achieve, committed to preparing K-12 students for postsecondary success in college, employment and life, teamed up with the National Governors Association and the Council of Chief State School Officers to publish “Benchmarks for Success: Ensuring US Students Receive A World-Class Education”, the seed for what has now become the Common Core Curriculum. The goal was to align school expectations with international benchmarking in order to “compete and innovate in the 21st century”. These standards recognize the central role of vocabulary in all language arts instruction and assign the teaching of academic vocabulary to its own potent learning strand, as a bridge to reading, writing, speaking and listening skills.

The Common Core Standards mandate that students in public schools receive rigorous instruction in academic vocabulary as a bridge to increasing literacy skills, yet they provide little guidance about how to teach these words and most teachers require direction to teach them effectively (Nagy & Townsend, 2012). In fact, vocabulary instruction occurs infrequently in American K-12 classrooms (Durkin, 1978; Scott et al., 2003; Watts, 1995), and students rarely receive the quality of vocabulary instruction that enables them to use newly-learned words independently (Beck, McKeown, &Kucan, 2002; Gersten, Dimino, Jayanthi, Kim, & Santoro, 2010; McKeown, Beck, Omanson, & Pople, 1985; Scott, Jamieson-Noel, & Asselin, 2003; Stahl & Fairbanks, 1986).

Effective teaching of academic vocabulary requires learners’ full engagement with words within content area instruction. As the portal to communication on disciplinary content, academic vocabulary is “abstract, technical, and nuanced” in ways that tailor it to its own disciplinary setting (Nagy & Townsend, 2012, p.93). Therefore, to effectively teach complex words, they must be taught within the disciplines in which they reside, not simply in isolated
vocabulary exercises. In other words, the most effective teaching strategies for academic vocabulary include not only the study of those particular words themselves, but also the study of the disciplinary content from which those words are taken. For example, the study of vocabulary words about biology would be most relevant, and therefore best taught, within passages and discourse about that science. In this study, academic vocabulary is taught as a bridge to literacy, using words about U.S. history, the Constitution and civic participation, taught within sentences and passages from the civics curriculum in which they reside.

**Rationale for the Current Study’s Approach to Morpho-Phonemic Instruction**

This study offers morpho-phonemic instruction to adult struggling readers to improve literacy skills, using an intervention program similar to the one Alamprese used with people in adult literacy classes (2011). To intensify learning outcomes, it employs evidence-based principles and practices of morphological and phonological instruction that have been successful with struggling readers at the late elementary, middle and high school levels, readers that closely resemble the population of this research. Specifically, the morpho-phonemic instruction delivers concentrated literacy treatment with the following elements: 1) the principles of effective morphological instruction, 2) morphological analysis through word sums, 3) reading and writing of words from the same morphological family with base extraction, and 4) grapho-syllabic analysis with identification of primary syllable stress.

From their work with adolescents, Kieffer and Lesaux (2010) recommended four principles of effective morphological teaching. First, they suggest that morphological teaching be done within the context of rich vocabulary instruction. Second, they recommend the teaching of a cognitive strategy, which in their study involved students recognizing that a word is unfamiliar, analyzing the word using familiar morphemes, developing and checking hypotheses about
unfamiliar word’s meanings based on known morphemes. Third, they advise teaching morphemes systematically, with ample practice and review. Finally, they urge that new words be taught within the meaningful contexts in which they occur. This study incorporates all four of these principles.

Bowers promotes the use of word sums to teach morphological analysis (Bowers & Cook, 2012; Bowers & Kirby, 2010) a technique that is consistent with evidence-based research showing large effect size gains after sub-lexical morphemic analyses (Bowers, Kirby & Deacon, 2010). Word sums depict the base of the word in an addend position, followed by the suffix in an addend position, followed by an arrow leading to the complex derived form in the sum position. When the base undergoes a letter drop in the spelling, a forward slash is used. For example, the word sum for the word *pleasantly* would be as follows: *please/* + *ant* + *ly* → *pleasantly*. In the current study, word sums are presented with morphemes written inside boxes in the addend positions and an equal sign leading to the derived form in the sum position, as in *please* + *ant* + *ly* = *pleasantly*.

When readers are exposed to written words that are members of the same morphological families, which are groups of complex words that share common bases or roots, they read those words better than they read words that are not members of morphological families. For example, adults read words from larger morphological families more quickly and accurately than they read words from smaller morphological families (Nagy, Anderson, Schommer, Scott & Stallman, 1989). This suggests that teaching morphological relatives would facilitate word recognition, as posited by Carol Chomsky (1970) when she stated that “lexical spellings” reveal connections between words’ pronunciations, spellings and meanings, which are especially useful when words’ pronunciations involve phonological changes from the base word to the derived form, as
in *courage*—*courageous*. In this study, participants practiced reading and writing morphological relatives of the target vocabulary words, then circling their common base words, to facilitate word analysis, word recognition, vocabulary and spelling.

Effective literacy instruction includes mapping of words’ semantic and phonological identities onto their orthographic identities (Ehri, 2000) so the current study infuses the critical phonological piece into the treatment in two ways, syllable division and assignment of primary syllable stress, or accentuated beat. Bhattacharya and Ehri (2004) compared how well struggling adolescent readers learned to read 100 phonologically complex words after instruction in grapho-syllabic analysis, which is also called syllabication or syllable division, and after instruction in whole word reading. Teens who had learned to parse words into syllables showed transfer of newly learned skills to recognize novel words that they had not been taught, whereas those who had learned to read words as whole units did not. Adolescents with lower reading skills at the third grade equivalency level showed greater treatment effect sizes than did those with higher reading skills at the fourth to fifth grade equivalency levels. Teaching identification of primary stress in syllables (Jarmulowicz, 2013) resulted in better word reading and predicted reading achievement as does performance on stress perception, rhyme and stress detection tasks (Holliman, Wood & Sheehy, 2010). This study teaches identification of primary stress after syllabication.

**Rationale for Selection of the Control Treatment**

Given the high correlation between vocabulary and literacy, and the central role of vocabulary teaching in progressive curricula like the Common Core, researchers have conducted a number of literature reviews to learn what kinds of vocabulary instruction work best. Taken
together, these reviews report that effective vocabulary teaching involves three elements: 1) information about both definitions and contexts of the words being taught, 2) multiple exposures to the vocabulary words, and 3) student engagement in deep processing of words’ meanings (Baumann, Kameenui & Ash, 2003; Beck, McKeown & Kucan, 2002; Blachowicz & Fisher, 2000; Mezynski, 1983; Nagy & Scott, 2000; Rupley & Nichols, 2005; Stahl & Fairbanks, 1986).

One group of researchers (Beck & McKeown, 2004) used an intervention program, called Elements of Reading®: Vocabulary (EOR-V) that delivered all three elements of effective vocabulary teaching to K-5 students in low income school districts. In a large randomized control study, 753 teachers, trained by reading coaches, implemented the EOR-V program to over 9,000 students as a supplement to their regular literacy curriculum. The intervention taught sophisticated vocabulary words with high utility across multiple content area subjects, called Tier 2 vocabulary. Over 1-2 years, classroom teachers taught 12 weekly vocabulary units in activities that went progressively deeper, from reading aloud, to viewing photos to discussing how and why to use words in certain contexts. In the experimental condition, teachers focused high level verbal skills like explaining what words meant and why they fit certain sentence contexts. In the control condition, teachers focused more on lower level verbal skills like recalling literal definitions. The students who received the EOR-V instruction made significantly greater gains on tests of word knowledge for vocabulary and comprehension than did the students who received only their regular literacy instruction. Thus, robust vocabulary instruction improved literacy without focus on word analysis. In the present study, participants received a similar, albeit shorter, kind of rich, in-depth vocabulary instruction that included words’ meanings and synonyms, parts of speech, multiple sentence contexts, and discussion of related words.
In addition to rich vocabulary instruction, teaching spelling also aids literacy learning, as encoding is the flip side of decoding (Ehri, 1997). When students write words’ spellings they receive multi-sensory, visual-kinesthetic feedback prompting them to focus on the sequence of the letters and to make associations between sounds and spellings, according to well-established methods for remediating reading disabilities (Fernald, 1943; Hulme, 1983). Empirical research upholds the value of multi-sensory spelling instruction to support literacy (Cunningham & Stanovich, 1990; Hulme & Bradley, 1984; Hulme, Monk & Ives, 1987). Spelling requires integration of visual-motor and kinesthetic processes with linguistic processes (Abbott & Berninger, 1993; Graham & Weintraub, 1996). In the current study, students were prompted to examine whole word’s sound and spelling patterns by writing target words’ spellings several times, visualizing and correcting their spellings, and responding to the question: “What made this word hard to spell? Here are some reasons why words can be hard to spell: Double letters, Silent letters, Hard-to-hear letters, and Surprising letters”.
Chapter 3

Method

Purpose/Research Questions

This study addressed the following questions and hypotheses:

1) How did the literacy skills of these adults in secondary education (GED classes) compare with skills seen in other studies of adult literacy?

It was expected that adults in secondary education classes would have higher literacy skills than those in adult basic education classes, as GED programs cater to those with higher literacy skills, at least at the 8th grade level (Perin, Flugman & Spiegel, 2006).

2) What are the relationships among component reading and vocabulary skills for adult struggling readers in secondary education?

Based on previous studies of readers in adult literacy programs, it was expected that the literacy skills for these adults in secondary education would be less integrated than the literacy skills of typical readers, with weaker skills in orthographic and phonological coding than in word reading, as seen in individuals in adult literacy programs (Greenberg, Ehri & Perin, 1997).

3) Does morpho-phonemic instruction or whole word instruction lead to better gains in component literacy skills (word analysis, word recognition, spelling, reading vocabulary and reading comprehension) for taught and untaught words?

Based on the Lexical Quality Hypothesis, literacy skills should show greater gain with morpho-phonemic intervention than with whole word instruction. This study is expected to replicate the results of the Bhattacharya and Ehri study (2004), in which the group who received the sub-
lexical word analysis showed greater transfer of literacy skills than the group who received whole word instruction without word analysis.

4) Does morpho-phonemic instruction or whole word instruction result in better comprehension of content that was taught, in this case, civics knowledge?

Based on the lexical quality hypothesis, it is likely that the group who learned to analyze words’ internal structures to integrate sounds, meanings and spellings will make better gains on reading comprehension as well, since improved word analysis may reduce obstacles to higher level processing of semantics and vocabulary, thereby increasing reading comprehension. On the other hand, studies of morphological intervention have typically shown only modest effect sizes for reading comprehension, so it could be that the duration of the present treatment was not long enough to show significant gains at the remote, supra-lexical layer of reading comprehension.

Participants

Forty-six adults volunteered to participate in the study after hearing announcements in their GED classes at an adult learning center in New York City. Recruited participants met the following criteria for inclusion: 1) current enrollment in or recent completion of a GED program, 2) proficiency in English and exposure to English language learning in early elementary school, 3) age 18-31 years old, 4) At least low average intelligence, and 5) no reported history of cognitive, neurological, hearing or uncorrected vision problems.

From the 46 who qualified to participate, 34 people went on to complete the entire study, lasting 6 weeks, with one week of pretesting, four weeks of tutoring and one week of post-testing. One third (4/12) of those who dropped out did so before they had even started the tutoring phase of the study. Those who did drop out after starting treatment came from both the
experimental and the control groups. Rather than being related to the treatment itself, attrition appeared to be related to difficulty getting childcare coverage, balancing employment, GED classes and tutoring schedules, adhering to scheduled appointments, weather related absences and illnesses, and in one case, finding safe haven in a shelter.

Incentives were created to facilitate participants’ completion of the intensive 6 week intervention study. Each of the 6 sessions lasted approximately 2 hours, including the screening/pre-testing session (week 1), the 4 tutoring sessions (weeks 2, 3, 4, and 5) and the post-testing session (week 6), totaling 4 hours of individual testing and 8 hours of individual tutoring. Participants were paid $25 for the screening/pre-testing session, $12 per hour for the tutoring and post-testing sessions and an additional $40 bonus upon completion of all 6 sessions. To further reduce attrition for these GED students, some of whom lived in transient home situations, the sessions commenced as soon as possible after 6-8 students had volunteered and met the criteria for inclusion. According to their own reports, students were motivated to participate by three incentives: 1) the chance to learn some of the content that was likely to be part of their upcoming GED tests, such as U.S. history, the Constitution and citizenship, 2) the chance to improve literacy and vocabulary skills, and 3) hourly payment that exceeded the minimum wage.

**Design and Materials**

In this randomized control study with pretest, intervention and post-test phases, participants completed pretests to: 1) screen for adequate intelligence, 2) screen for oral English proficiency, 2) calculate overall reading composites for random assignment, 3) establish baseline skills from which to measure progress in literacy and civics content and 4) investigate the
relationships between reading skills, civic knowledge and civic engagement. All screenings, pre-
tests and post-tests were administered individually.

1) Screening Measures

A) Test of Nonverbal Intelligence-4 (TONI-4)

To screen for adequate nonverbal intelligence, participants followed spoken directions to point to the picture that best completed the visual pattern depicted in line drawings. Examinees chose from a field of four options to complete the visual arrays that progressed from simple to complex geometric patterns of various orientations and details. Items were scored as either correct or incorrect and there was only one correct response for each one. This test was scored by both the P.I., and a research assistant. According to the test manual, norms for 19-29 year olds were based on a sample of 277 people, with high reliability for that age group, with average coefficient alphas of .94, for Form A (Johnson, Brown, & Sherbenou, 2010).

B) Woodcock-Munoz Language Survey- R (Oral Language Cluster)

To screen for oral English proficiency, participants completed the two subtests that together comprised the oral language cluster of the Woodcock-Munoz Language Survey- R (WMLS-R): Picture Vocabulary and Verbal Analogies (Schrank, Alvarado, Wendling, & Woodcock, 2010). For both subtests, the P.I. gave the tests individually, tallied the raw scores, then entered those raw scores into the Compu-Scoring program using the CD provided by the test publisher. Raw scores, grade and age equivalents were checked by a research assistant to measure scoring agreement.

For the Picture Naming subtest, participants followed spoken directions to name pictures depicted in the test booklet, as a measure of expressive vocabulary. One point per item was
awarded for correct responses, all of which were listed, along with allowable prompts, in the test booklet to uphold objectivity. Raw scores were calculated by the primary investigator, then checked by a research assistant. Using the Compu-Scoring software, raw scores were entered, then converted into Standard Scores and Percentiles. According to the test manual, the test had a median internal consistency coefficient of .87. (Schrank et al, 2010).

To measure semantic knowledge and semantic relationships, examinees listened to incomplete verbal analogies read aloud by the examiner, then supplied the missing final item in the analogy, as instructed in the test manual. One point was given for each correct response, with acceptable responses and prompts listed in the test booklet to promote scoring objectivity. All raw scores, and corresponding age and grade equivalents were rechecked by one of the research assistants. According to the test manual, the Verbal Analogies subtest had a split-half reliability Coefficient of .92 (Schrank et al., 2010).

2) Standardized Pretest and Posttest Measures

To measure pretest and posttest performance, in order to calculate gain scores, participants completed selected language and literacy tests from the Woodcock Johnson Tests of Achievement-III (WJ-III). All tests were given by either the primary investigator or a research assistant who had completed coursework in diagnostics as a master’s level student studying to become a Speech Language Pathologist. For all subtests of the WJ-III, examiners gave Form A as pre-tests and Form B as post-tests.

A) Woodcock-Johnson Tests of Achievement-III (WJ-III)

WJ-III Letter-Word Identification
To measure word recognition skills, participants followed oral instructions to read aloud the pronunciations of letters and words that were printed in the test booklet. Target words progressed from letters to simple, frequently occurring words to complex, less frequently occurring words. Correctly pronounced words were scored as 1 point, with 0 for incorrectly pronounced words. There was one right answer for nearly all items, though several items had two correct responses with acceptable responses and prompting listed in the test booklet. All items were scored by both the P.I. and the research assistant. The test manual reports a Spearman-Brown split half reliability coefficient of .94. (Woodcock, McGrew, & Mather, 2007).

**WJ-III Reading Vocabulary**

To estimate comprehension of printed words, participants completed a three part task of reading vocabulary. For the first part, they read words aloud and then orally produced synonyms of those words, whereas for the second part, they read words aloud and then supplied their antonyms. For the third part, they were shown two words representing an analogous relationship, followed by a third word which echoed the analogous relationship, but was missing the final word. Participants had to orally supply the missing word that completed the analogy. Acceptable answers and prompting for nearly correct answers were listed in the test booklet, and each correct response was awarded one point. All items on the test were scored by both the P.I. and a research assistant. The test manual reports a Spearman-Brown split half reliability coefficient of .90. (Woodcock et al., 2007).

**WJ-III Passage Comprehension**

To measure how well participants comprehended what they read, they followed oral directions to read silently from sentences and passages printed in the test booklet, then fill in the
missing word that would make sense at the end of the sentence or passage. Using the cloze procedure, they silently read sentences and passages of increasing complexity in terms of vocabulary and text cohesion. Correct responses and permissible prompts for nearly-correct responses were listed in the test booklet to promote objectivity in scoring, and correct items were awarded 1 point. All test items were scored twice, by the P.I. and a research assistant. Published in the test manual is a Spearman-Brown split-half reliability coefficient of .88. (Woodcock et al., 2007).

**WJ-III Word Attack**

The purpose of the Word Attack test was to measure participants’ ability to decode unfamiliar words. To ensure that words would be unfamiliar, nonsense words with phonetically plausible spellings were used. Participants were instructed to read aloud the nonsense words, which became increasingly complex in terms of their phonological and morphological structures. All acceptable pronunciations were listed in the test booklet, to reduce subjectivity in scoring procedures that awarded one point for each correctly pronounced nonsense word. All items were scored by the P.I. and a research assistant. According to the test manual, the Spearman-Brown split-half reliability coefficient for this subtest is .87. (Woodcock et al., 2007).

**WJ-III Spelling Dictation**

To measure spelling skills, participants wrote words that were dictated by the examiner, who instructed them to listen to the word in isolation, within a sentence and then again in isolation, and then write the spelling of the word. Dictated words became increasingly complex in terms of their phonological and morphological structures. Correctly spelled words were given one point in the standardized scoring procedures, and there was only one acceptable answer for
each item. Both the P.I. and the research assistant scored all items. The test manual reports a Spearman-Brown split half reliability coefficient of .90. (Woodcock et al., 2007).

**WJ-III Spelling of Sounds**

To measure pure encoding skills apart from semantic knowledge, participants were instructed to spell nonsense words. Adhering to the directions for administration, examiners instructed participants to listen to words that were not real words and try to spell them the way they thought the words should be spelled. Acceptable responses were listed in the test manual, and all plausible spellings for the dictated words were awarded one point. Tests were scored by both the P.I. and the research assistant. The test manual reports a Spearman-Brown split-half reliability coefficient of .76 for this subtest. (Woodcock et al., 2007).

**WJ-III Picture Vocabulary**

To estimate expressive vocabulary skills, examiners read aloud standardized instructions asking participants to name pictures representing objects, animals, places and other categories, as depicted with watercolor drawings in the test booklet. Acceptable responses and prompts for nearly-correct answers were listed in the test booklet to reduce subjectivity in scoring. One point was awarded for each correct response, and all items were scored by both the P.I. and the research assistant. The test manual reports a Spearman-Brown split-half reliability coefficient of .81. (Woodcock et al., 2007).

3) **Experimental Pretests and Posttests**

A) **Word Knowledge Test of Morphological Awareness**
To measure total morphological knowledge, participants completed one test with portions that were adapted from prior experimental studies.

Root Words and Vocabulary (Bellomo, 2009)

For part A- Root Words, participants read meaningful root word parts silently, then selected, through multiple choice with 4 options, the best meaning of the target root word. For example, *scrib* means *write*. Each of the 10 items had one correct response and tests were scored by two scorers. For Part B- Vocabulary, participants were instructed to select, using a multiple choice format, the best meaning for morphologically complex words. For example, *gratify* means *to please*. Each of the 15 items had only one correct response and was awarded one point by the two independent scorers. Chronbach’s alpha reliability coefficient was .65 for the combined Root Words and Vocabulary portions of Bellomo’s experimental task.

Sentence Choice (Mahony, 1994)

After one trial demonstration item, participants chose, from a multiple choice format, the suffixed word that best fit the sentence context. All of the sentences contained a blank followed by four words with the same base word with a different suffix or ending. They were instructed to circle the word that best fitted in the blank. For example, for one item, participants were required to silently read the printed sentence “*Fortunately, age improved his ________ “, followed by the choices: *a) personality, b) personal, c) personify, or d) personalize*. For all 27 sentences, there was only one correct answer, (e.g., *personality*, in the example above) and each item was scored by two scorers. Guttman split-half reliability coefficient was .86.

Morphological Structure- Derivation (Clin, Wade-Woolly & Heggie, 2009)
Participants were instructed to read a base word silently, then to change that base word into one of its derived forms that would best complete the printed sentence context. For example, appear/ appearance. All 20 items required participants to write the derived form that would best complete the printed sentence context. To be counted as correct, participants needed to use the same answers as those on the scoring key, with derived forms that were grammatically, semantically and orthographically accurate within the sentence. All items were scored by two scorers. Guttman split-half reliability coefficient was .93.

**Word Recognition**

To measure word reading skills, participants read aloud morphologically complex words taken from lists of target words from prior studies of morphological awareness. These words were not taught during the tutoring sessions. Words included a wide range of prefixed and suffixed words, for which there was only one correct pronunciation. Scoring was conducted by the primary investigator or the research assistant who administered the pretest and posttest, both of which contained the same words. Two scorers reviewed the marked scoring sheets. Using post-test raw scores from the odd and even items, Guttman split-half reliability coefficient was 94.

**B) Civic Knowledge Test**

To measure participants’ reading comprehension of the civics content that was taught to them, they completed the Civic Knowledge Test. The 26 questions were taken directly from the high school civics curriculum assessment test from *We The People: The Citizen and The Constitution* (Center for Civic Education, 2009). Topics covered included the origins of American democracy, citizens’ rights as written in the First, Fourth, Thirteenth and Fourteenth
Amendments to the Constitution, the civil rights movement, the women’s suffragist movement, and the participatory roles of citizens in a constitutional democracy. Participants circled their answers, using a multiple choice format, after reading each item. Because the test items were taken from a high school civics curriculum that was at a higher reading level than most of the participants’ reading skills, examiners read aloud each item to the participants, as they followed along reading the items silently, to ensure accurate word recognition and fluency. For example, one item required students to answer a question about whether American citizens in a constitutional democracy are expected to: a) promote their own individual rights without thinking about the common good of society, b) let the government be wholly responsible for solving social problems, c) disregard their own personal preferences when they make political choices or d) think about public issues in a critical way and be involved in public affairs. There was only one correct answer for each question (i.e., option d in the above example) and correct answers were given one point. This test was checked by two scorers. Guttman split-half reliability coefficient was .49.

C) The Civic Engagement Quiz

To measure civic engagement, participants completed the Civic Engagement Quiz, a brief survey of behaviors that were indicative of their involvement in such activities as voting and community volunteering. All survey items were read aloud by the examiner to ensure accurate word recognition and fluency. Whenever they requested clarification of a survey item, examiners further explained the questions to ensure comprehension. All questions were followed by three boxes corresponding to graduated levels of affirmative or negative answers. For example, one question asked “Do you vote in both national and local elections?” for which students could check the box beside “Yes, always”; “Yes, usually”, or “No”. Survey responses were transferred
into the civic engagement checklist for a summary of their civic engagement behaviors. The summary page was scored by two scorers. As a pretest, this was administered to survey their past experiences; as a post-test, it was administered as a projective quiz, to survey their future behaviors, each item preceded with the question, “How likely are you to do this in the future?” Participants indicated their responses from 1-5, using a 5 point rating scale ranging from “very likely” to “not at all likely”. (See Appendix I).

D). Intra-session Pretests and Posttests

1. Extract Roots (Base Words)

   To measure participants’ learning gains in word analysis skills, students in both groups were instructed to “Circle the main part of the words”, while presented with the morphologically complex words that were being taught. For all participants, no further prompting was given. For example, participants would circle the base word equal in the complex word equality. Each session, they completed this task for the ten target words being taught that session. After the teaching part of the session was finished, participants in both groups then took the same assessment as a posttest to measure their word analysis gains during the session. Thus, participants completed the “Extract Roots” test twice during each session, first as a pre-test at the start and then as a post-test at the end of the session, with 10 words each session, for all 40 words. One point was awarded for each word on which the smallest English base word was circled. Tests were scored by two independent scorers. To measure internal reliability, total post-test raw scores from sessions 1 and 3 were correlated with total post-test raw scores from sessions 2 and 4 to yield a common inter-item reliability of .83 using a parallel form assumption.

2. Read Words
To measure learning gains in word recognition skills, participants were instructed to read the target words aloud, before each session and then read the same list of words aloud after each session. Each session, the target words included the ten morphologically complex vocabulary words that participants would be learning each session. For example, they read the word *discrimination* before reading the passages about how the civil rights movement fought to end racial discrimination. One point was awarded for each word that was read aloud accurately with fully correct pronunciations including the correct syllable stress. Thus, participants attempted to read 10 words at pretest and posttest and 40 words in total. All tests were scored by two scorers. To measure internal reliability, total post-test scores from sessions 1 and 3 were compared with total post-test scores from sessions 2 and 4 for inter-item reliability, yielding a high common inter-item correlation coefficient of .88, using a parallel form assumption.

3. Spell Words

To measure learning gains in spelling skills, participants were asked to spell the same 10 target words at the start and at the finish of each session. Tutors dictated the words in isolation twice, but did not dictate the words within sentence contexts, as that may provide clues for the word matching task that followed the spelling task. For example, participants were asked to spell the word “constitutionality” before they read about the constitutional amendments. Thus, they spelled the same 10 words at pretest and at posttest, for a total of 40 words over the course of the entire treatment. Points were given for all words spelled correctly, and tests were scored by two scorers. To measure internal reliability, total post-test raw scores from sessions 1 and 3 were correlated with total post-test raw scores for sessions 2 and 4 to yield a common inter-item reliability of .93 using a parallel form assumption.
4. Match Vocabulary

To assess learning gains in vocabulary skills, participants were instructed to “Match vocabulary words to their meanings”. Target words included the ten words for each session and the exact meanings that they would be taught in the session. Vocabulary words were listed on the left column of the page and their definitions were listed out of order on the right column of the same page. For example, the word “destiny” matched up with the definition “purpose or fate”. Pretests and posttests contained the same 10 vocabulary matching items per session, totaling 40 items by the end of the intervention. All correct responses were awarded one point and tests were scored by two scorers. To measure internal reliability, total post-test raw scores from sessions 1 and 3 were correlated with total post-test raw scores for sessions 2 and 4 to yield a common inter-item reliability of .70, using a parallel form assumption.

5. Complete Sentences

To measure learning gains in reading comprehension, participants were instructed to choose the word from each set of 10 target words that best completed the sentence and write the number of that word on the line. Target words were the academic vocabulary words that were taught for each session, and this task was presented as pre-tests and post-tests at the start and end of each session. For example, to complete the sentence “The government of the United States works best when people have a________ to community service”, the correct response was “commitment”. All items had only one correct response each of which was awarded one point. Tests were scored by two scorers. To measure internal reliability, total post-test raw scores from sessions 1 and 3 were correlated with total post-test raw scores for sessions 2 and 4 to yield a common inter-item reliability of .72, using a parallel form assumption.
Random Assignment to Treatment

To ensure that there would be roughly equivalent groups receiving each intervention approach, participants were ranked according to their reading skills, then matched in pairs and randomly assigned to each group. To determine their reading levels, Reading Composites were calculated by using the average of measures that represented the essential skill components of reading- oral word reading (WJ-III: Letter Word ID), word meaning (WJ-III: Reading Vocabulary), and reading comprehension (WJ-III: Passage Comprehension). Raw scores on each of these three WJ-III subtests were separately converted to grade equivalents using the conversion table in the test booklet. The grade equivalents were then added together and divided by three to get the mean grade equivalent or Reading Composite. Thus, the Reading Composite was the mean grade equivalent of the Letter Word ID, Reading Vocabulary and Passage Comprehension of the WJ-III. The P.I. ranked participants according to their Reading Composites, then matched them in pairs for random assignment to the interventions. The two tutors then randomly assigned each member of the matched pair to either morpho-phonemic or whole word treatment. Both members of the matched pairs received tutoring by the same tutor.

To establish baseline reading levels from which to measure treatment gains, the following WJ-III Achievement subtests were also given as pre-tests: 1) Word Attack, 2) Spelling, 3) Spelling of Sounds. Pre-tests and post-tests also included experimental measures of Morphological Awareness (Appendix B) and two measures of civics: 1) the Civic Knowledge Test and 2) the Civic Engagement Quiz.
Intervention Programs

The experimental intervention adhered to the general principles of effective morphological instruction for adolescents, as recommended by Kieffer and Lesaux (2010). Morphemes were taught systematically using frequent flexible stems and ample practice opportunities. A cognitive-linguistic strategy was taught involving word analysis and extraction of Latin or Greek root words. Complex words were taught within relevant thematic passages (Kieffer & Lesaux, 2010), specifically on civics education.

The 40 vocabulary words (See Appendix A) were chosen to comply with the characteristics of academic vocabulary, and were mostly nouns derived from Latin and Greek word origins (Townsend & Nagy, 2012). Selected from the high school civics curriculum We The People; The Citizen and The Constitution, the word list was submitted to the English Lexicon Project data base (Balota et al., 2007) for an analysis of their attributes in terms of frequency and linguistic characteristics. All words were: 1) morphologically complex, with at least one base word and at least one affix; 2) low-frequency words, occurring not more than 25 times per million (m = 9.41) in the SUBTLWF spoken word index, and not more than 30 times per million (m = 17.70) in the Kucera Francis printed words index. The selected words ranged from 2 morphemes (citizenry) to 4 morphemes (abolitionists) and from 2 syllables (drafted) to 7 syllables (constitutionality). Words were either nouns (23/40), verbs (8/40) or adjectives (6/40), but several (3/40) served dual functions as both verb and noun (petitioning, warrants) or verb and adjective (segregated). Words’ definitions and synonyms were created for the study using the Merriam Webster online dictionary (http://www.merriam-webster.com/dictionary). Information about the words’ origins, root words and morphological relatives was taken from an
online etymology reference source (http://dictionary.reference.com; http://www.etymonline.com/).

Each participant had a total of 6 sessions totaling about 12 hours over 6 weeks. This included approximately 2 hours of pre-testing (week 1), 8 hours of individual tutoring delivered 2 hours once a week for 4 weeks (weeks 2, 3, 4, and 5), and 2 hours of post-testing after all 4 of the tutoring sessions had been completed (week 6).

The two interventions were controlled in terms of learning components, with the only difference being that one treatment taught the 40 vocabulary words through morph-phonemic analysis whereas the other taught the same 40 words through whole word instruction. To create parallel treatments, the interventions were administered using scripted PowerPoint Presentations with 580 slides for each slideshow (See Appendix B). For both groups, each word was taught within a set of 10 words using semantic maps which displayed the same number of instructional elements. Many of the teaching elements were the same for both groups, including reading aloud the word, definition, synonym, sentence and passage context. All reading passages were modified excerpts from a high school level civics curriculum focusing on the rights and responsibilities of American citizens. Excerpts from We the People: The Citizen & the Constitution, Level 3, copyright 2009, were used by permission of the Center for Civic Education, www.civiced.org.

In each tutoring session, participants completed pretesting, teaching and post-testing of the 10 target words. For the pretest and posttest, they were required to: 1) read the 10 target words aloud, 2) extract the base or root words from the words, 3) spell the words, 4) match the words to their synonyms, and 5) complete sentences using the words. During the teaching part,
sandwiched between the identical pretest and posttest, they received explicit tutoring to learn the words with semantic maps and collaborative oral reading of passages.

For both treatments, tutor and student took turns reading their respective prompts and responses, as in a responsive reading, written and presented in the slideshow (PowerPoint), using a laptop computer (Dell Inspiron 14R with Intel ® HD Graphics). Thus, students received the instruction via both visual presentation from the slideshow and the printed semantic map, and auditory presentation as the tutor and student read aloud the prompts and responses. The scripted prompts required various kinds of receptive and productive responses, including writing of words and synonyms and oral reading of words, sentences and passages.

**Morpho-Phonemic Treatment**

Students assigned to morpho-phonemic instruction learned the 40 academic vocabulary words using a semantic map that displayed the following teaching elements: 1) definitions, 2) synonyms, 3) sentence context, 4) word origin, 5) word sum, 6) suffix role (part of speech), 7) related words with the same root and 8) syllable scoop with assignment of primary stress. Students in the morpho-phonemic training completed the following sequence of tasks for each target word, with their binders opened to the printed version of the semantic map or civics passage. Here, the target word inalienable is used as an example.

1) **Word Reading:** Read aloud the word *(inalienable)* from the slideshow, with their workbook binders opened to the printed version of the same graphic organizer.

2) **Definition:** Read aloud the definition of the word *(impossible to take away or give up)* written on the semantic map.
3) **Synonym:** Read aloud from the slideshow, and then copy the synonym (*unchallengable*) onto the semantic map.

4) **Sentence Context:** Read aloud the sentence printed on the semantic map (*The founders wrote that the right to life, liberty and the pursuit of happiness were inalienable rights*).

5) **Word Origin:** Read aloud the word origin and English base (*Latin alienus = foreign; English base = alien*) from the slideshow and copy onto the semantic map.

6) **Word Sum:** Read aloud the word sum (*in + alien + able = inalienable*) from the slideshow, copy it onto the semantic map, then circle its base (*alien*).

7) **Suffix Role:** Tell if the part of speech changed (yes, base word is noun or adjective, derived form is adjective), spelling changed (no) or pronunciation changed (no) from the base word to the derived form. If necessary, participants looked at an index card with parts of speech described.

8) **Morphological Relatives:** Read aloud from the slideshow 2 morphologically related words that share the same root or base (*alienated, alienation*), copy them onto the semantic map, and circle the base word in each.

9) **Syllabification:** Clap or tap out the syllables in the word, write the word in syllables, draw scoops under each syllable (*in a li en a tion*), and underline the syllable that has the primary stress (*in a li en a tion*).

10) **Passage Reading:** Read aloud passage with the word embedded through collaborative oral reading (tutor reads the brown print, tutee reads the black print).
Traditional, Whole Word Treatment

Students assigned to whole word instruction learned the 40 academic vocabulary words using a semantic map that displayed the following teaching elements: 1) definitions, 2) two sentence contexts, 3) synonym, 4) part of speech, 5) related word, 6) write word, 7) letter count 8) visualization with spelling and corrections twice, 9) Metacognitive task: What makes it hard to spell? Students in the whole word training completed the following sequence of tasks for each target word, with their binders opened to the printed semantic map or civics passage. Here again, the target word inalienable is used as an example.

1) **Word Reading:** Read aloud the word *(inalienable)* from the slideshow, with their workbook binders opened to the printed version of the same graphic organizer.
2) **Definition:** Read aloud the definition of the word (*impossible to take away or give up*) written on the semantic map.

3) **Sentence Context 1:** Read aloud the sentence printed on the semantic map (*The founders wrote that the right to life, liberty and the pursuit of happiness were inalienable rights*).

**Sentence Context 2:** Read aloud the second sentence context about a young adult (*The young man argued that by going to prison, he would lose his inalienable rights*).

4) **Synonym:** Read aloud from the slideshow, and then copy the synonym (*unchallengable*) onto the semantic map.

5) **Part of Speech:** Tell the part of speech of the target word (*adjective*). If necessary, participants looked at an index card with parts of speech described.

6) **Related Word:** Produce a related word orally and then in writing, Students say and write the word itself (*your rights*) and the reason why the target word makes them think of the related word (*because they can’t be taken away*).

7) **Letter Count:** Copy the spelling of the word from the slideshow or semantic map and write the number of letters in the word (*11*).

8) **Spelling:** Look at the word, visualize the spelling, spell it from memory, and then self-correct any errors. Then do the same thing again, to imprint the spelling of the word in memory.

9) **Metacognitive Task:** Tell what makes the target word hard to spell, such as double letters, silent letters, hard to hear letters, or surprising letters.
10) **Passage Reading:** Read aloud passage with the word embedded through collaborative oral reading (tutor reads the brown print, tutee reads the black print).

**Figure 2. Example of Graphic Organizer for Traditional Whole Word Instruction**

**Figure 3. Comparison of Instructional Elements**

<table>
<thead>
<tr>
<th><strong>Morpho-Phonemic Instruction</strong></th>
<th><strong>Whole Word Instruction</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Read word.</td>
<td>• Read word.</td>
</tr>
<tr>
<td>• Read definition.</td>
<td>• Read definition.</td>
</tr>
<tr>
<td>• Read and write synonym.</td>
<td>• Read and write synonym.</td>
</tr>
<tr>
<td>• Read 1 sentence context.</td>
<td>• Read 2 sentence contexts.</td>
</tr>
<tr>
<td>• Tell role of suffix, changes from base to derivative.</td>
<td>• Tell part of speech.</td>
</tr>
<tr>
<td>• Read and copy 2 morphologically related words sharing the target word base, then circle base word.</td>
<td>• Produce a related word (meaningful to participant for personal connection) and write it.</td>
</tr>
<tr>
<td>• Read and write word origina and English base, then circle base words.</td>
<td>• Copy, count the letters in the word, visualize, spell, self-correct. Repeat this step to imprint in memory.</td>
</tr>
<tr>
<td>• Parse word into scooped syllables of one beat and one vowel sound, then underline primary stress.</td>
<td>• Tell why target word is hard to spell, tuning in to the sounds and spellings.</td>
</tr>
<tr>
<td>• Read passage with word embedded in civics content.</td>
<td>• Read passage with word embedded in civics content.</td>
</tr>
</tbody>
</table>
**Reduction of Bias**

Four procedural safeguards were put into place to reduce the potential bias of the tutors teaching and testing in ways that might give an unfair advantage to those receiving the experimental protocol, thus leading to an affirmation of the hypotheses. First, a research assistant, unaware of the P.I.’s hypotheses, delivered instruction to half of the first two sets of participants. Second, after participants were ranked and paired together according to their reading levels, each tutor confidentially and randomly assigned each member of the pairs to different treatments. Tutors taught each member of the pairs separately, in a private office. The post-testing was administered by the tutor who had not delivered the treatment, and who was blind to the kind of treatment that had been given. Third, all tutoring was scripted using PowerPoint Presentations with equivalent, parallel elements of instruction. Lastly, scoring of the standardized tests was done using the computer scoring software from the Woodcock-Johnson Tests of Achievement (Woodcock, McGrew & Mather, 2007).

**Fidelity checks**

The P.I. and research assistants conducted three kinds of fidelity checks: 1) to check objectivity in tutor training, 2) to check tutors’ adherence to the intervention scripts, and 3) to check scoring of the pre and post-tests.

To reduce teaching bias, prior to beginning the tutoring, the research assistant who was assigned to the role of tutor received an orientation presented by the P.I. The orientation, which was video-taped, conveyed scripted explanations of both treatment methods, with descriptions of each method being equally valid, and assertions that either one could lead to gains in literacy and content learning.
The research assistant who was assigned to the role of fidelity checker sampled the teaching of 25% of the vocabulary treatment sessions by randomly sampling one session of ten words from each participant’s binder of worksheets. Filling out a checklist of adherence to treatment, she indicated whether each teaching element had been included in the sessions, and whether the worksheet showed evidence of having veered from the scripted teaching sessions.

The tutors scored their own testing, from within each session. Later, all scoring was checked by two people. Disagreements in scoring, which were rare (about 2% of total scores), were resolved though consensus, which involved the checking of scores, discussion of any inconsistencies and agreement on the score that was deemed accurate.

**Data Collection**

All of the session pretests, worksheets for semantic maps, and posttests were collected in individual student binders. Pretests and posttests from the experimental and standardized tests were collected in individual participant folders. All data were de-identified by assigning every participant a number, to ensure confidentiality, according to the protocol on the IRB approval. The key to participants’ identifiable information was kept in a locked file.

**Data Analysis**

Outcome measures were analyzed statistically both within each group and between the two groups, according to the following four categories:

1) Standardized literacy and vocabulary tests from the WJ-III (Letter Word ID; Spelling; Passage Comprehension; Word Attack; Reading Vocabulary; Spelling of Sounds; and Picture Vocabulary)
2) Experimental Tests: The Morphological Awareness Test, and Civics Measures (Civic Knowledge Test; the Civic Engagement Quiz)

3) Intra-session Pretest and Posttest Measures (Extract Base Words, Read Words, Soell Words, Match Definitions and Complete Sentences)

For the standardized literacy and vocabulary tests from the WJ-III, pretest raw scores (WJ-III: Form A) were converted to standard scores, then compared through ANOVAs to the posttest standard scores (WJ-III: Form B). All raw score to standard score conversions were calculated using the WJ-III Compu-Score software, entering the participant’s chronological age as the basis for deriving the standard scores. For the Morphological Awareness Test, raw scores from pretests were compared with raw scores from posttests, through ANOVAs, using identical forms of that test. Similarly, for the Civic Knowledge Test, raw scores at pretest were compared through ANOVAs with raw scores at posttest, using the same form of the test. For the Civic Engagement Quiz, participants’ pretreatment ratings of their civic activities, electoral activities and total civic engagement activities, were summed then compared, through ANOVAs, with their posttreatment ratings of the same activities. For the Treatment Sessions measures, pretest and posttest scores were summed over the four tutoring sessions, then examined for effect sizes on gain scores.

To measure the magnitude of gain from pretest to posttest within treatment groups, effect sizes were calculated using the following formula for calculating Cohen’s d (Cohen, 1988): \[d = \frac{\text{post treatment } M - \text{pretest } M}{\text{pretest standard deviation}}\]. In this case, pretest standard deviations are considered more meaningful than pooled standard deviations because they are in the units of the original measurements (Hawell, 2008). In general, effect sizes of at least .20 are considered small, at least .50 are considered medium and at least .80 are considered large.
However, it is important to consider effect sizes using outcomes in similar studies as a reference for gauging the magnitude of gain after treatment. As a reference point, Alamprese et al. (2011) studied the effects of an experimental treatment teaching adult struggling readers how to analyze complex words’ phonemes, morphemes and spellings and compared them to the effects of a traditional adult literacy treatment without word analysis. Researchers found greater effect sizes after morpho-phonemic treatment with than after the traditional treatment with greatest gains in vocabulary (d = .27) and word attack (d = .24) with wide variance in word recognition (d = .05 - .21).
Chapter 4

Results

Characteristics of Participants

The two treatment groups did not differ significantly on any pretest measures (See Tables 1 and 2.) and were remarkably similar on all measures except gender, which also fell short of significance. Both groups had reading skills that were estimated to be at the 6th grade equivalency, as measured by the Reading Composite, the mean grade equivalent on the WJ-III Letter Word Identification, Reading Vocabulary and Passage Comprehension subtests. This falls within the range reading skills for GED programs which cater to students with at least 8th grade level reading skills, but often serve students reading below the 5th grade levels (Perin, Flugman & Spiegel, 2006). In terms of oral language proficiency, both groups had limited to severely limited skills on the WMLS Oral Language Cluster (Picture Vocabulary and Verbal Analogies subtests). Although the group who received morpho-phonemic teaching had a slightly higher mean score (m = 80.29) than the group who received robust vocabulary teaching with whole words (m = 75.18), these differences were not statistically significant (p = .18). Both groups had average nonverbal IQ standard scores of 92 (morpho-phonemic group SD = 8.89; whole word group SD = 6.71), indicating average intelligence compared to their age peers. Similarly, both groups’ participants had mean ages of 24 years old (morpho-phonemic group SD = 3.97; whole word SD = 4.53) and mean grades of 10th grade (morpho-phonemic group SD = .97; whole word group = 1.14, as the last grade completed. Likewise, groups did not differ significantly in terms of being monolingual or bilingual, with nearly identical ratios of monolingual to bilingual
Table 1.

Means and Standard Deviations on Characteristics of Participants as a Function of Treatment

Prior to Treatment

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Treatment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Morpho-Phonemic Word Study</td>
<td>Whole Word Study</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>M</td>
<td>(SD)</td>
<td>N</td>
</tr>
<tr>
<td>Reading Composite (WJ-III ACH)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade Equivalency (2.7-10.10)</td>
<td>17</td>
<td>6.51</td>
<td>(1.61)</td>
</tr>
<tr>
<td>Oral Language Proficiency (WMLS-R)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Score</td>
<td>17</td>
<td>80.29</td>
<td>(7.50)</td>
</tr>
<tr>
<td>Nonverbal Intelligence (TONI-4)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index</td>
<td>17</td>
<td>92.00</td>
<td>(8.89)</td>
</tr>
<tr>
<td>Age (19-31)</td>
<td>17</td>
<td>24.65</td>
<td>(3.97)</td>
</tr>
<tr>
<td>Last Grade Completed (8-12)</td>
<td>17</td>
<td>10.06</td>
<td>(.97)</td>
</tr>
<tr>
<td>Monolingual or Bilingual</td>
<td>17</td>
<td>(M=7; B=10)</td>
<td>17</td>
</tr>
<tr>
<td>Gender (Female; Male)</td>
<td>17</td>
<td>(F= 7; M= 10)</td>
<td>17</td>
</tr>
<tr>
<td>Race (Latino, African Descent)</td>
<td>17</td>
<td>(L=10; AD=7)</td>
<td>17</td>
</tr>
</tbody>
</table>

*For WMLS-R and TONI-4, the mean standard score was 100.
### Table 2.
ANOVA Test Statistics on Characteristics of Participants as Function of Treatment Prior to Treatment

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group (G)</th>
<th>$F$ (1, 33)</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Composite (WJ-III ACH) (Range = 2.7-10.10)</td>
<td></td>
<td>.03</td>
<td>.86 n.s.</td>
</tr>
<tr>
<td>Oral Language Proficiency (WMLS) SS</td>
<td></td>
<td>1.89</td>
<td>.18 n.s.</td>
</tr>
<tr>
<td>Nonverbal Intelligence (TONI-4) Index</td>
<td></td>
<td>.03</td>
<td>.86 n.s.</td>
</tr>
<tr>
<td>Age (Range = 19-31)</td>
<td></td>
<td>.01</td>
<td>.94 n.s.</td>
</tr>
<tr>
<td>Last Grade Completed (Range = 8-12)</td>
<td></td>
<td>.48</td>
<td>.49 n.s.</td>
</tr>
<tr>
<td>Monolingual or Bilingual</td>
<td></td>
<td>.45</td>
<td>.51 n.s.</td>
</tr>
<tr>
<td>Gender (Female; Male)</td>
<td></td>
<td>3.08</td>
<td>.09 n.s.</td>
</tr>
<tr>
<td>Race (Latino, African Descent)</td>
<td></td>
<td>.31</td>
<td>.58 n.s.</td>
</tr>
</tbody>
</table>
participants in the morpho-phonemic group (M=7: B=10) and the whole word group (M = 8: B = 9). Both groups also had slightly more Latino/a participants than individuals of African descent. Although there was a higher ratio of female to males for the whole word study group (F= 12: M= 5) than for the morpho-phonemic group (F= 7: M= 10), that difference did not reach significance (p = .09).

**Comparisons Between Groups on Pretest Measures**

As illustrated in Table 3, the groups who received morpho-phonemic instruction obtained slightly higher scores on pretest measures on standardized tests of literacy and vocabulary; however, when ANOVAS were applied to the groups’ mean scores, there was no significant difference between the intervention groups, as seen in Table 4. In fact, the differences between the groups’ pretest standard scores did not approach statistically significant levels, ranging from p = .21 (WJ-III Spelling) to p = .86 (WJ-III Reading Vocabulary).

When comparing the groups’ pretest performance on the experimental tasks, the group who had morpho-phonemic teaching earned slightly higher mean scores (M = 8.19; SD = 2.74) than did the group with whole word teaching (M = 6.59; SD = 2.37) on the Vocabulary portion of the Morphological Awareness Test. However, this difference did not reach statistical significance, as revealed in the ANOVA test for MA/Vocabulary (p = .08) shown in Table 4. All other pretest scores on the Morphological Awareness Test were insignificant, ranging from p = .15 for the MA/Spelling task to p = .94 for the MA/Root extraction task. Likewise, the two groups’ performances on the civics measures for the Civic Knowledge Test and the Civic Engagement Quiz did not differ significantly, as seen in Tables 3 and 4.
Table 3.
Means and Standard Deviations on Pretests as Function of Treatment

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Morpho-Phonemic Group</td>
</tr>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>____________________________________________________________________________</td>
<td></td>
</tr>
<tr>
<td><strong>Woodcock Johnson-III (Tests of Achievement)</strong></td>
<td>(17)</td>
</tr>
<tr>
<td>WJ-III Word ID SS</td>
<td>(17)</td>
</tr>
<tr>
<td>WJ-III Spelling SS</td>
<td>(17)</td>
</tr>
<tr>
<td>WJ-III Pass.Comp. SS</td>
<td>(17)</td>
</tr>
<tr>
<td>WJ-III Word Attack SS</td>
<td>(17)</td>
</tr>
<tr>
<td>WJ-III Spell Sounds SS</td>
<td>(17)</td>
</tr>
<tr>
<td>WJ-III Picture Vocabulary SS</td>
<td></td>
</tr>
<tr>
<td><strong>Morphological Awareness Test</strong></td>
<td></td>
</tr>
<tr>
<td>MA/Roots (Maximum = 10)</td>
<td>(16)</td>
</tr>
<tr>
<td>MA/Vocabulary (Maximum = 15)</td>
<td>(16)</td>
</tr>
<tr>
<td>MA/Sentences (Maximum = 27)</td>
<td>(16)</td>
</tr>
<tr>
<td>MA/Spelling (Maximum = 20)</td>
<td>(17)</td>
</tr>
<tr>
<td>MA/Subtotal (Maximum = 72)</td>
<td>(16)</td>
</tr>
<tr>
<td>MA/Word Recognition (Max = 79)</td>
<td>(17)</td>
</tr>
<tr>
<td>MA/Total (Maximum = 151)</td>
<td>(16)</td>
</tr>
</tbody>
</table>
Table 3. (continued)
Mean Performance and Standard Deviations on Pretests as Function of Treatment Prior to Treatment

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Morpho-Phonemic Group</th>
<th>Whole Word Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>Civic Knowledge Test (Maximum = 26)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(17)</td>
<td>10.18</td>
<td>2.60</td>
</tr>
<tr>
<td>Civic Engagement Quiz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civic Activities (Maximum = 9)</td>
<td>(17)</td>
<td>.94</td>
</tr>
<tr>
<td>Electoral Activities (Maximum = 5)</td>
<td>(17)</td>
<td>.71</td>
</tr>
<tr>
<td>Total (Maximum = 14)</td>
<td>(17)</td>
<td>1.65</td>
</tr>
</tbody>
</table>

56
Table 4.
ANOVA Test Statistics on Pretests as a Function of Treatment Prior to Treatment

| Dependent Measures                          | Main Effect | Group (G) |  |   |   |
|---------------------------------------------|-------------|-----------|-----------|-------------------------------------------------|
|                                             |             |           |           | F (1, 33) | p   | Partial Eta Squared |
| **Woodcock Johnson-III**                    |             |           |           |           |     |                        |
| (Tests of Achievement)                      |             |           |           |           |     |                        |
| WJ-III Word ID SS                           |            | .521      | .48       | .02      |
| WJ-III Spelling SS                          |            | 1.65      | .21       | .05      |
| WJ-III Pass.Com. SS                         |            | .55       | .46       | .02      |
| WJ-III Word Attack SS                       |            | .41       | .53       | .01      |
| WJ-III Rd. Vocab. SS                        |            | .02       | .86       | .00      |
| WJ-III Spell Sounds SS                      |            | .43       | .52       | .01      |
| WJ-III Picture Vocabulary SS                |            | .47       | .50       | .01      |
| **Morphological Awareness Test**            |             |           |           |           |     |                        |
| MA/Roots                                    |            | .01       | .94       | .00      |
| MA/Vocabulary                               |            | 3.23      | .08       | .09      |
| MA/Sentences                                |            | 1.14      | .29       | .04      |
| MA/Spelling                                 |            | 2.15      | .15       | .05      |
| MA/Subtotal                                 |            | 1.20      | .28       | .06      |
| MA/Word Recognition                         |            | 1.47      | .24       | .05      |
| MA/Total                                    |            | 1.52      | .23       | .05      |

Note: **p < .01; *p < .05**
Table 4. (continued)

ANOVA Test Statistics on Pretests as a Function of Treatment Prior to Treatment

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Main Effect</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group (G)</td>
<td>$F$ (1, 33)</td>
<td>$p$</td>
</tr>
<tr>
<td>Civic Knowledge Test (Maximum = 26)</td>
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<td>.59</td>
<td>.45</td>
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<tr>
<td>Civic Engagement Quiz</td>
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<td>.07</td>
<td>.79</td>
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<tr>
<td>Civic Activities (Maximum = 9)</td>
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<td>.01</td>
<td>.91</td>
</tr>
<tr>
<td>Electoral Activities (Maximum = 5)</td>
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<td>.02</td>
<td>.90</td>
</tr>
<tr>
<td>Total (Maximum = 14)</td>
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</tr>
</tbody>
</table>

Note: ** $p < .01$; * $p < .05$
Correlations Among Pretest Measures:

Correlations between measures of nonverbal intelligence, literacy and vocabulary are shown in Table 5. Relationships between Letter Word Identification and all other measures of literacy and vocabulary were fairly strong ($r = .62-.82$), especially for Spelling of real words and Word Attack ($r = .80-.82$). Spelling of real words correlated highly with the Spelling of Sounds and Word Attack ($r = .72-.81$) but less strongly with Passage Comprehension, Reading Vocabulary and Picture Vocabulary ($r = .49-.56$). Passage Comprehension showed moderately strong relationships with Picture Vocabulary and Reading Vocabulary ($r = .69-.76$) but weak relationships with Spelling of Sounds and Word Attack ($p = .47-.49$). The two measures of spelling showed strong relationships between each other ($r = .72$). The two strongest correlations were for those tests measuring vocabulary, Picture Vocabulary and Reading Vocabulary ($r = .84$) and those tests measuring coding skills, Word Attack and Spelling of Sounds ($r = .84$). Nonverbal IQ correlated weakly with all measures of literacy and vocabulary ($r = .05-.33$).

Previous research with adult literacy students demonstrated significant discrepancies between word recognition and coding skills, whereas the present study does not. To be specific, prior studies of adult struggling readers revealed higher skills when reading high frequency words with irregular spellings, and lower skills for phonological and spelling tasks (Greenberg, Ehri & Perin, 1997; Sabatini, Sawaki, Shore & Scarborough, 2010). Participants in the current study, in contrast, demonstrated very high correlations between component literacy measures, including word reading and spelling ($r = 82$), and word reading and word attack ($r = .80$), similar to the correlations between component reading skills for typically developing readers (Greenberg, Ehri & Perin, 1997). Thus, the readers in the current study had better integrated component reading skills, closer to those of skilled readers, than adult literacy students with severe coding deficits but relatively stronger whole word reading of common words.
Table 5.
Correlation Coefficients for Nonverbal Intelligence, Literacy and Vocabulary Skills

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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
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<td>4. Passage Comp. (WJ-III)</td>
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<td>.49**</td>
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<tr>
<td>Mean = 86.24</td>
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<td>Standard Deviation = 8.28</td>
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<td>5. Word Attack (WJ-III)</td>
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<td>6. Reading Vocabulary (WJ-III)</td>
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<td>.72**</td>
<td>.49**</td>
<td>.76**</td>
<td>.47**</td>
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<td>Standard Deviation = 7.68</td>
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<td>7. Picture Vocabulary (WJ-III)</td>
<td>.05</td>
<td>.75**</td>
<td>.56**</td>
<td>.69**</td>
<td>.47**</td>
<td>.84**</td>
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<tr>
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<tr>
<td>8. Spelling of Sounds</td>
<td>.33</td>
<td>.67**</td>
<td>.72**</td>
<td>.37**</td>
<td>.84**</td>
<td>.33</td>
<td>.42*</td>
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<tr>
<td>Mean = 85.15</td>
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<td></td>
</tr>
<tr>
<td>Standard Deviation = 10.35</td>
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</tr>
</tbody>
</table>

Note: ** p < .01; * p < .05
Outcome Measures for Treatment Sessions Between Groups

Using Cohen’s $d$ calculations, Cohen created general categories of effect sizes to allow for comparison of treatment gains across measures and studies. Small effect sizes are at least $d = .20$, medium effect sizes are at least $d = .50$ and large effect sizes are at least $d = .80$ (Cohen, 1988). For the present study, a decision rule was declared such that effect sizes must be close to large ($d = \text{at least} \ .75$) to infer a difference between pretest and posttest measures.

Table 6 shows the treatment effect sizes for each group when comparing pretest and posttest gains during the treatment sessions on target word tasks. Both groups had at least small effect sizes for all dependent measures, with large effect sizes for most measures. Participants had large effect sizes when asked to Read Words (target words) after morpho-phonemic treatment ($d = 1.38$) and also after whole word instruction ($d = .88$). When required to Extract Roots (from complex target words), effect sizes within sessions were highly discrepant between the groups; Those who received morpho-phonemic instruction made very large gains ($d = 2.67$), and those who received whole word instruction had small gains ($d = .25$). When required to Spell Words (target words), young adults in both treatment groups had similar magnitudes of improvement, with the whole word group effect size ($d = .77$) and the morpho-phonemic group effect size ($d = .76$) being about equal. This was despite the fact that the whole word group had more practice writing and analyzing the spellings of words than the morpho-phonemic group. When called upon to Match Definitions, the within-session outcome measure of reading vocabulary, both groups had large treatment effects, with the whole word group having slightly larger effect sizes ($d = 1.02$) than the morpho-phonemic group ($d = .96$). The groups made similar magnitudes of gain when asked to Complete Sentences, the within-session measure of
Table 6.
Pretest, Posttest, Gain Scores and Effect Sizes by Group for Taught Words during Treatment Sessions

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gains</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N) M (SD)</td>
<td>(N) M (SD)</td>
<td>M (SD)</td>
<td>d</td>
</tr>
<tr>
<td><strong>Read Words (Word Recognition) (max = 40)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>(17) 24.00 (10.86)</td>
<td>(17) 33.59 (9.04)</td>
<td>9.59 (5.52)</td>
<td>.88</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>(17) 24.94 (8.66)</td>
<td>(17) 36.88 (4.31)</td>
<td>11.94 (5.62)</td>
<td>1.38</td>
</tr>
<tr>
<td><strong>Extract Roots (Word Analysis) (max = 40)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>(17) 13.82 (7.62)</td>
<td>(17) 15.71 (7.13)</td>
<td>1.88 (4.28)</td>
<td>.25</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>(17) 20.29 (3.77)</td>
<td>(17) 30.35 (3.71)</td>
<td>10.06 (3.73)</td>
<td>2.67</td>
</tr>
<tr>
<td><strong>Spell Words (Spelling) (max = 40)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>(17) 20.71 (11.95)</td>
<td>(17) 29.88 (11.17)</td>
<td>9.18 (5.82)</td>
<td>.77</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>(17) 24.88 (9.47)</td>
<td>(17) 32.06 (8.07)</td>
<td>7.12 (3.52)</td>
<td>.76</td>
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<tr>
<td><strong>Match Definitions (Vocabulary) (max = 40)</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>(17) 18.59 (7.64)</td>
<td>(17) 26.41 (8.24)</td>
<td>7.82 (5.92)</td>
<td>1.02</td>
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<tr>
<td>Morpho-Phonemic:</td>
<td>(16) 22.31 (6.49)</td>
<td>(16) 28.56 (7.80)</td>
<td>6.25 (5.39)</td>
<td>.96</td>
</tr>
<tr>
<td><strong>Complete Sentences (Comprehension) (max = 40)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>(17) 19.65 (8.37)</td>
<td>(17) 26.53 (9.17)</td>
<td>6.88 (5.63)</td>
<td>.82</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>(16) 22.31 (6.49)</td>
<td>(16) 28.56 (7.80)</td>
<td>6.25 (5.39)</td>
<td>.96</td>
</tr>
</tbody>
</table>

Within group effect sizes (ES) were calculated as Cohen’s d (Cohen, 1988) using the following formula: \(d = \frac{\text{post treatment } \overline{m} - \text{pretest } \overline{m}}{\text{pretest standard deviation}}\). In this case, pretest SD is more meaningful than pooled SD because it is in the units of the original measurements (Hawell, 2008). Calculations were checked using the ES calculator at [http://www.uccs.edu/~lbecker/](http://www.uccs.edu/~lbecker/).

\(a\). Difference between mean gains was significant at \(p < .001\).
reading comprehension, with whole word teaching yielding slightly smaller effect sizes ($d = .82$) than morpho-phonemic teaching ($d = .96$).

In summary, both groups showed large pretest to posttest test gains within their teaching sessions for all but one dependent measure involving target words. The one exception was the Extract Roots task where the whole word group showed little gain, not surprisingly because they were not taught how to do this.

Table 7 displays the ANOVA statistics to compare the gain scores for each treatment group on the measures taken during each session. The only significant difference for the within-session dependent measures was for the Extract Roots test. Recall that this test required participants to circle the base or root words inside the complex target words. For example, for the target word *constitutionality*, participants should have circled the base word *constitute*. On this task, the morpho-phonemic group made gains that were significantly higher than those of the whole word study group ($p < .001$).

**Outcome Measures of Standardized Literacy and Vocabulary Tests Within Each Group**

Table 8 shows the magnitude of improvement for each group on standardized tests using untaught words and passages, with effect sizes calculated using the same formula as for the gains on taught words. Cohen’s $d$ (Cohen, 1988) was calculated as: $d = \frac{\text{post treatment } M - \text{pretest } M}{\text{pretest standard deviation}}$ because pretest standard deviations are considered more meaningful than pooled standard, as they are in the units of the original measurements (Hawell, 2008).

In contrast to the large effect sizes seen for most within-session tasks using target words, effect sizes were either small ($d = .20$ to $.49$) or non-existent on all standardized tests (WJ-III) of Letter Word ID (word reading), Word Attack (word analysis), Spelling (of real words) and
Table 7.
ANOVA Test Statistics on Dependent Measures for Words Taught During Treatment Sessions
As a Function of Treatment

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Group (G)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Main Effect</td>
<td>$F$ (1, 32)</td>
<td>$p$</td>
</tr>
<tr>
<td>Read Words (Word Recognition)</td>
<td>1.52</td>
<td>.23</td>
<td>.05</td>
</tr>
<tr>
<td>Extract Roots (Word Analysis)</td>
<td>35.19</td>
<td>.00***</td>
<td>.53</td>
</tr>
<tr>
<td>Spell Words (Spelling)</td>
<td>1.59</td>
<td>.22</td>
<td>.05</td>
</tr>
<tr>
<td>Match Definitions (Vocabulary)</td>
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<td>.43</td>
<td>.02</td>
</tr>
<tr>
<td>Complete Sentences (Comprehension)</td>
<td>.00</td>
<td>.98</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note: *** $p < .001$; ** $p < .01$; * $p < .05$
Table 8.
Within Group Treatment Effect Sizes for Dependent Variables to Measure Learning Transfer to Untaught Material

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain Score</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(N)</td>
<td>M (SD)</td>
<td>M (SD)</td>
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<tr>
<td>WJ-III Letter Word ID SS</td>
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<tr>
<td>Whole Word:</td>
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<td>82.94 (11.00)</td>
<td>82.12 (10.64)</td>
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<td>Morpho-Phonemic:</td>
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<td>86.29 (7.31)</td>
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</tr>
<tr>
<td>Whole Word:</td>
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<td>85.18 (13.97)</td>
</tr>
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<td>Morpho-Phonemic:</td>
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<td>90.24 (9.58)</td>
<td>91.41 (11.16)</td>
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<td>WJ-III Pass.Comp. SS</td>
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<td>Whole Word:</td>
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<td>85.18 (8.52)</td>
<td>81.18 (17.78)</td>
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<td>87.29 (8.15)</td>
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<td>WJ-III Word Attack SS</td>
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<td>Whole Word:</td>
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<td>WJ-III Rd. Vocab. SS</td>
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<td>Whole Word:</td>
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<td>82.47 (8.66)</td>
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<td>82.00 (6.83)</td>
<td>82.35 (5.99)</td>
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* Difference in mean gains was significant at p<.05.
Table 8. (continued)
Within Group Treatment Effect Sizes for Dependent Variables to Measure Learning Transfer to Untaught Material

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain Score</th>
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<td>M (SD)</td>
<td>M (SD)</td>
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<tr>
<td><strong>WJ-III Spell Sounds SS</strong></td>
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<td>Whole Word:</td>
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<td>83.50 (10.73)</td>
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<td>(17)</td>
<td>76.35 (9.34)</td>
<td>74.76 (8.79)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>(17)</td>
<td>78.47 (8.65)</td>
<td>78.59 (8.87)</td>
</tr>
<tr>
<td><strong>MA/Roots (maximum 10 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td></td>
<td>5.35 (1.84)</td>
<td>4.65 (1.11)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td></td>
<td>5.31 (1.40)</td>
<td>5.38 (1.63)</td>
</tr>
<tr>
<td><strong>MA/Vocabulary (maximum 15 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td></td>
<td>6.59 (2.37)</td>
<td>7.41 (2.27)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td></td>
<td>8.19 (2.74)</td>
<td>8.36 (2.96)</td>
</tr>
<tr>
<td><strong>MA/Sentences (maximum 27 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td></td>
<td>19.88 (6.33)</td>
<td>20.76 (6.11)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td></td>
<td>21.81 (3.58)</td>
<td>22.56 (3.44)</td>
</tr>
</tbody>
</table>
Table 8. (continued)
Within Group Treatment Effect Sizes for Dependent Variables to Measure Learning Transfer to Untaught Material

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD) d</td>
</tr>
<tr>
<td><strong>MA/Spelling (maximum 20 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>10.00 (5.22)</td>
<td>10.24 (5.49)</td>
<td>.24 (1.86)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>12.24 (3.51)</td>
<td>13.00 (4.12)</td>
<td>.76 (1.44)</td>
</tr>
<tr>
<td><strong>MA/Subtotal (maximum 72 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>43.81 (10.37)</td>
<td>44.81 (10.48)</td>
<td>1.00 (2.76)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>47.63 (9.27)</td>
<td>49.31 (10.13)</td>
<td>1.69 (2.80)</td>
</tr>
<tr>
<td><strong>MA/Word Recognition (maximum 79 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>56.69 (14.43)</td>
<td>60.63 (12.72)</td>
<td>3.94 (3.38)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>61.76 (9.72)</td>
<td>64.88 (8.18)</td>
<td>3.12 (2.89)</td>
</tr>
<tr>
<td><strong>MA/Total (maximum 151 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>100.50 (24.10)</td>
<td>105.44 (22.57)</td>
<td>4.94 (4.49)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>109.81 (18.16)</td>
<td>114.44 (17.87)</td>
<td>4.63 (4.18)</td>
</tr>
<tr>
<td><strong>Civic Knowledge Test (maximum 26 correct)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word:</td>
<td>9.50 (3.27)</td>
<td>10.31 (2.65)</td>
<td>.81 (3.83)</td>
</tr>
<tr>
<td>Morpho-Phonemic:</td>
<td>10.18 (2.60)</td>
<td>11.18 (3.07)</td>
<td>1.00 (2.32)</td>
</tr>
</tbody>
</table>
### Table 8. (continued)

Within Group Treatment Effect Sizes for Dependent Variables to Measure Learning Transfer to Untaught Material

<table>
<thead>
<tr>
<th></th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(N)</td>
<td>M</td>
<td>(SD)</td>
</tr>
<tr>
<td>Civic Engagement Quiz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civic Activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word Group:</td>
<td>(16)</td>
<td>1.06</td>
<td>(1.24)</td>
</tr>
<tr>
<td>Morpho-Phon. Group:</td>
<td>(17)</td>
<td>.94</td>
<td>(1.39)</td>
</tr>
<tr>
<td>Electoral Activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word Group:</td>
<td>(16)</td>
<td>.63</td>
<td>(1.09)</td>
</tr>
<tr>
<td>Morpho-Phon. Group:</td>
<td>(17)</td>
<td>.71</td>
<td>(.77)</td>
</tr>
<tr>
<td>Total Civic Engagement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Word Group:</td>
<td>(16)</td>
<td>1.69</td>
<td>(2.12)</td>
</tr>
<tr>
<td>Morpho-Phon. Group:</td>
<td>(17)</td>
<td>1.65</td>
<td>(1.69)</td>
</tr>
</tbody>
</table>

Within group effect sizes (ES) were calculated as Cohen’s d (Cohen, 1988) using the formula: \( d = \frac{\text{post treatment m} - \text{pretest m}}{\text{pretest standard deviation}} \), because pretest SD is more meaningful than pooled SD since it is in the units of the original measurements (Hawell, 2008). Calculations were checked using the ES calculator at [http://www.uccs.edu/~lbecker/](http://www.uccs.edu/~lbecker/).
Spelling of Sounds (in nonsense words), Reading Vocabulary, and Passage Comprehension. For Letter Word ID, the morpho-phonemic group approached a small effect size ($d = .17$), but the whole word group did not, with a negative gain score ($d = -.07$). For Spelling, neither group showed any improvement ($WW d = .00$; $MP d = .12$). For Passage Comprehension, the morpho-phonemic group approached a moderate effect size ($d = .41$) but the whole word group had a negative gain score with a negative effect size ($d = -.40$). For Word Attack, the morpho-phonemic group approached a medium effect size ($d = .41$). In contrast, the whole word group showed a negative effect size ($d = -.10$). For Reading Vocabulary, the morpho-phonemic group approached a small effect size ($d = .15$), but the whole word group again had a negative gain score and a negative effect size ($d = -.15$). For the Spelling of Sounds, neither group achieved a small effect size, though the whole word group was slightly larger ($WW d = .12$; $MP d = .09$). Likewise, for Picture Vocabulary, neither group had a small effect size, with the whole word group showing a negative effect size ($d = -.17$), and the morpho-phonemic group showing no effect ($d = .01$).

**Outcome Measures of Standardized Literacy and Vocabulary Tests Between Groups**

Table 9 shows the ANOVA statistics comparing pre to posttest gains of the treatment on the standardized literacy and vocabulary tests. Recall that these tests measured transfer effects of taught material to untaught material. For two of the standardized tests, the WJ-III Letter Word ID and Word Attack, the morpho-phonemic group made significantly greater transfer gains than did the whole word group. For Letter Word ID, the analysis of variance was highly significant, with $F(1.32) = 7.24$ and $p = .01$. For Word Attack, the ANOVA was significant as well, with $F(1.32) = 4.51$ and $p = .04$. Thus, the group taught vocabulary by sub-lexical analysis transferred
**Table 9.**

ANOVA Test Statistics on Gain Scores of Dependent Measures as a Function of Treatment to Assess Significant Differences Between Groups for Learning Transfer to Untaught Material

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Main Effect</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group (G)</td>
<td>$F$ (1, 32)</td>
<td>$p$</td>
</tr>
<tr>
<td><strong>Woodcock Johnson-III</strong> (Tests of Achievement)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WJ-III Word ID SS</td>
<td>7.24</td>
<td>.01*</td>
<td>.19</td>
</tr>
<tr>
<td>WJ-III Spelling SS</td>
<td>.05</td>
<td>.83</td>
<td>.00</td>
</tr>
<tr>
<td>WJ-III Passage Comprehension SS</td>
<td>.77</td>
<td>.39</td>
<td>.02</td>
</tr>
<tr>
<td>WJ-III Word Attack SS</td>
<td>4.51</td>
<td>.04*</td>
<td>.12</td>
</tr>
<tr>
<td>WJ-III Reading Vocabulary SS</td>
<td>1.66</td>
<td>.21</td>
<td>.05</td>
</tr>
<tr>
<td>WJ-III Spell Sounds SS</td>
<td>.00</td>
<td>.96</td>
<td>.00</td>
</tr>
<tr>
<td>WJ-III Picture Vocabulary SS</td>
<td>.67</td>
<td>.42</td>
<td>.01</td>
</tr>
<tr>
<td><strong>Morphological Awareness Test</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA/Roots (total 10)</td>
<td>2.20</td>
<td>.15</td>
<td>.07</td>
</tr>
<tr>
<td>MA/Vocabulary (total 15)</td>
<td>.61</td>
<td>.44</td>
<td>.02</td>
</tr>
<tr>
<td>MA/Sentences (total 27)</td>
<td>.04</td>
<td>.84</td>
<td>.00</td>
</tr>
<tr>
<td>MA/Spelling (total 20)</td>
<td>.87</td>
<td>.36</td>
<td>.03</td>
</tr>
<tr>
<td>MA/Subtotal (total 72)</td>
<td>.49</td>
<td>.49</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note: **$p < .01$; *$p < .05$**
Table 9. (continued)

ANOVA Test Statistics on Gain Scores of Dependent Measures as a Function of Treatment to Measure Learning Transfer for Untaught Material

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Main Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group (G)</td>
</tr>
<tr>
<td></td>
<td>$F(1, 32)$</td>
</tr>
<tr>
<td>MA/Word Recognition (total 79)</td>
<td>.56</td>
</tr>
<tr>
<td>MA/Total (total 151)</td>
<td>.42</td>
</tr>
<tr>
<td><strong>Civic Knowledge Test</strong> (Maximum = 26)</td>
<td>.03</td>
</tr>
<tr>
<td>Civic Engagement Quiz</td>
<td></td>
</tr>
<tr>
<td>Civic Activities (Maximum = 9)</td>
<td>.02</td>
</tr>
<tr>
<td>Electoral Activities (Maximum = 5)</td>
<td>5.25</td>
</tr>
<tr>
<td>Total (Maximum = 14)</td>
<td>1.12</td>
</tr>
</tbody>
</table>

Note: ** $p < .01$; * $p < .05$
what they had learned to read new words more successfully (both real and nonsense words) than the group taught vocabulary by whole word study without sub-lexical analysis. In contrast, the whole word group did not transfer that knowledge to the reading of new words.

**Outcome Measures for the Morphological Awareness Test Within Each Group**

Table 8 shows the effect sizes for the Test of Morphological Awareness, a combination of short subtests designed to measure the same linguistic categories that were the focus of treatment: Roots, Vocabulary, Sentences, Spelling and Word Recognition. For MA/Roots, neither group showed a positive effect size, with the whole word group showing a negative effect size (WW $d = -.38$; MP $d = .02$). For MA/Vocabulary the whole word group had a small treatment effect size ($d = .24$) but the morpho-phonemic group did not ($d = .06$). For MA/Sentences, the morpho-phonemic group had a small effect size ($d = .21$) and the whole word group approached a small effect size ($d = .14$). For MA/Spelling, the morpho-phonemic group again showed a small effect size ($d = .22$), but the whole word group did not ($d = .05$). For the MA/SubTotal, which included all tasks that were not word reading tasks, the morpho-phonemic group approached a small effect size and the whole word group did not ($d = .10$). The biggest effect sizes for both groups were for MA/Word Recognition, with slightly larger effect sizes for the morpho-phonemic group ($d = .32$) than for the whole word group ($d = .27$). Similarly, the MA/Total yielded slightly higher scores for morpho-phonemic treatment ($d = .25$) than for whole word treatment ($d = .20$).
Outcome Measures for the Morphological Awareness Test Between the Groups

To compare the two treatment groups on gains from pretest to posttest on these measures, ANOVAs were conducted. As Table 9 shows, none of the ANOVA statistics for the various subtests on the Morphological Awareness Test were statistically significant.

Outcomes on Civics Measures Within Each Group

Recall that two measures of civics were taken at pretest and posttest times, including the Civic Knowledge Test and the Civic Engagement Quiz to measure the effects of treatment. To assess content learning, participants completed the Civic Knowledge Test whose questions covered material that was taught within the sessions. To assess transfer of the new civics content knowledge to behaviors that demonstrate civic awareness, participants answered questions on the Civic Engagement Quiz.

Table 8 shows that for both measures of civics, within group treatment effect sizes were calculated using Cohen’s d as the measure of effect size, with the formula \(d = \frac{\text{posttest } M - \text{pretest } M}{\text{pretest standard deviation}}\). For the Civic Knowledge Test, both intervention groups showed small gains, with the morpho-phonemic group’s effect size being slightly higher \((d = .38)\) than the whole word group’s effect size \((d = .25)\).

Table 8 also shows large gains for the Civic Engagement Quiz “Civic Activities” by both the whole word group \((d = 4.94)\) and the morpho-phonemic group \((d = 4.40)\). Likewise, for the Civic Engagement Quiz “Electoral Activities”, large effect sizes were seen for both groups, with larger gains for the whole word group \((d = 2.63)\) than for the morpho-phonemic group \((d = 1.75)\). For “Total Civic Engagement”, a combination of the “Civic Activities” and the “Electoral Activities”, both groups had very large gains, with slightly larger gains for the morpho-phonemic group \((d = 4.42)\) than for the whole word group \((d = 4.25)\).
Outcomes on Civics Measures Between Groups

To learn whether one intervention group made significantly larger gains than the other treatment group, ANOVAs were applied to the gain scores of each group.

Table 9 displays the ANOVA statistics for the civics measures comparing the two groups. There was no statistical difference between the groups’ treatment gains on the Civic Knowledge Test, with $F(1, 32) = .03$ and $p = .86$. Likewise, the groups’ gains on The Civic Engagement Quiz “Civic Activities” did not differ. However, there was a statistical difference between the two groups on the “Electoral Activities” favoring the whole word group, with $F = 5.25$ and $p = .03$. On the Civic Engagement Quiz total, though, the difference between the groups was not significant.

Debriefing Interview

At the end of the final tutoring session, each participant completed the “debriefing interview” to measure their response to the treatment, in terms of both motivation and receptivity to the tutoring. All participants (34/34) answered “yes” to the question, “Did you find this kind of teaching helpful?” Furthermore, the great majority of participants (31/34) also answered “no” to the question “Have you ever had this kind of instruction before?”

Fidelity Checks

Recall that the P.I. and research assistants did fidelity checks to check scoring of the pre and post-tests, to counter potential tutor bias through checking adherence to the intervention scripts and conceptions about experiment hypotheses.

1) Fidelity of Standardized Tests Scoring:
For all standardized tests, checked by two scorers, inter-scorer reliability was 98%, as 1492 out of 1530 scores were consistent for both scorers.

2) Fidelity of Sessions Tests Scoring:
Within session scoring was also checked by two scorers, and the inter-scorer reliability was 98%, as they were in agreement for 13,392 out of 13,600 scoring items.

3) Adherence to Treatment:
For each participant, 25 percent of the pages in their treatment binders (containing their written work) were checked by a second person to see if their work reflected the same steps and responses that were described in the intervention protocol as scripted in the PowerPoint slides. This was accomplished by having a research assistant randomly select one of the treatment sessions for each of the 34 participants. She then used a scoring rubric that contained the scripted elements of the intervention. Both groups had a high level of adherence to treatment script, with 92% adherence for the whole word instruction and 98% adherence for the morpho-phonemic instruction. Furthermore, the research assistant who conducted the tutoring of 6 participants in the beginning of the study reported at the end of the study that she did not know the hypothesis of the experiment, nor did she have any sense of which treatment had yielded greater language and literacy gains.

To learn whether one tutor had more success than the other, participants’ gain scores were compared using the pretest and posttest scores for both the standardized tests and the within-session tests. Comparisons between the two tutors’ teaching outcomes showed no difference between them on standardized tests of literacy and vocabulary, with ANOVA statistics ranging from $F(1, 11) = 0$ and $p = 1.0$ for both WJ-III Spelling and Passage Comprehension gains to $F(1, 11) = 79$ and $p = .39$ for the WJ-III Spelling of Sounds. When
comparing teaching outcomes during the sessions for each tutor, there was only one gain score
that differed significantly with $F(1, 11) = 5.89$ and $p = .04$, as one tutor’s instruction yielded
greater gains from pretest to posttest for the Read Words probe of instruction.

When time of treatment was compared for each treatment group through ANOVAs, there
was a significant difference between the two groups ($p = .05$) with the experimental group
receiving less time on average ($M = 427$ minutes; $SD = 43$ minutes) than the control group ($M =
454$ minutes; $SD = 31$ minutes).
Chapter 5

Discussion

Few studies have investigated methods to increase adult literacy skills, particularly for young adults who have dropped out of high school, for whom reading disabilities are pervasive. This experiment explored the impact of morpho-phonemic instruction on the literacy skills of young adults working toward high school equivalency diplomas in an urban adult learning center. All 34 participants were Latino or African American struggling readers with 3rd to 10th grade reading levels who learned English either as their native language or as their second language in childhood. Participants were ranked by reading skill levels, then randomly assigned to tutoring in either morpho-phonemic word study or the control intervention, whole word study, to learn 40 academic vocabulary words taught within relevant passages in civics. They completed intensive, parallel interventions over 8 hours in 6 weeks, including 4 hours of pre and posttests.

Did the results of the study support the hypotheses?

This study answered the questions that it asked at the outset, with results that mostly, though not entirely, supported the hypotheses that were formulated at the start of the study.

The first hypothesis was that adult GED students would have significantly reduced literacy skills, as was the case in a similar study of urban GED students and literacy in which up to half of them read at levels below the fifth grade equivalency level (Perin, Flugman & Spiegel, 2006). In the present study, participants’ mean reading levels were estimated to be at the 6th grade equivalency levels.
The second hypothesis was that the participants in the present study would demonstrate poorly integrated component reading skills, as did adults with reading disabilities enrolled in adult literacy classes (Greenberg, Ehri & Perin, 1997). This hypothesis was generally not supported, as readers in the current study demonstrated component reading skills that were highly correlated with each other, as would be typical of skilled readers. To be specific, previous studies of adult struggling readers showed poor coding skills for both decoding and encoding, with relatively stronger word recognition of whole words (Greenberg, Ehri & Perin, 1997), whereas this study showed very high correlations ($r = .80$) between decoding and word recognition, spelling and word recognition ($r = .82$).

Third, it was hypothesized that the adults who received morpho-phonemic treatment would show significantly greater learning of the target vocabulary words. Instead, both groups made excellent gains on the taught words, without significant differences between the groups, apart from the root word analysis task, which was predicted to favor the morpho-phonemic group, given the treatment contrast. In support of the hypothesis, those learners who received morpho-phonemic teaching transferred newly learned reading skills to the reading of untaught words on standardized tests assessing both word attack and word recognition. These findings lend support to the lexical quality hypothesis and the theory of word identity amalgamation.

Fourth, the results did not support the hypothesis that students given morpho-phonemic instruction would show significantly greater gains in reading vocabulary and in comprehension. However, a closer look at the group differences reflected by effect size comparisons revealed that the greatest improvements occurred at the sub-lexical (word analysis) and lexical (word recognition) levels, but not at the higher supra-lexical layers of language learning, and this is consistent with other studies of morphological intervention (Bowers, Kirby & Deacon, 2010).
How did the literacy skills of these adults in secondary education (GED classes) compare
with skills seen in other studies of adult literacy?

Skilled readers generally have well integrated reading skills, with high correlations
among component reading skills. Poor readers, on the other hand, usually have uneven skills that
do not correlate highly with each other on testing. In this study, correlations were higher among
reading and spelling components \((r = .82)\) than they were in a study of students in adult literacy
classes, in which reading and spelling components correlated at the level of \(r < .60\). (Greenberg
et al, 2011). One reason is that the students in this study were enrolled in GED classes, whereas
the students in the Greenberg et al. study (2011) were in adult basic education classes and had
more severely reduced reading skills between the 3\(^{rd}\) and 5\(^{th}\) grade equivalency levels than the
students in the current study whose reading skills were on average at the 6\(^{th}\) grade equivalency
level. Students in adult basic education classes generally have lower reading skills than those in
adult secondary education classes (Perin, Flugman & Spiegel, 2006), as was the case in the
present study.

In the present study, many readers had severely reduced vocabulary skills which were on
par with reduced skills in other areas, resulting in an evening out of literacy component skills.
For example, Picture Vocabulary and Reading Vocabulary skills were highly correlated with
each other and were severely reduced for this sample of adult struggling readers, as is typical in
urban adult education programs serving people in low income districts (Kieffer, 2008).

Consistent with the severely reduced vocabulary skills of the students in this study, high
correlations were observed between standardized tests measuring similar linguistic levels. For
example, test scores that measured sub-lexical aspects of reading, like decoding and encoding of
phonetically regular nonsense words, correlated highly with each other. Similarly, participants’ performance on tests measuring lexical aspects of literacy, such as word level reading and spelling of real words, correlated highly as well. At the supra-lexical layer of literacy, passage comprehension correlated highly with reading vocabulary and word reading, both of which draw heavily on word knowledge skills to enable readers to pronounce complex words with assignment of primary stress, a prosodic feature also at the supra-lexical layer of language.

**Why Did Both Treatment Groups Make Large Gains Learning Taught Vocabulary Words?**

Recall that during each tutoring session, participants completed pretests with the target words to see if they already knew how to read the words (word recognition), extract the base words (word analysis), spell the words (spelling), match the words to their definitions (reading vocabulary) and complete sentence using the words (reading comprehension). Then they received individual instruction in either morpho-phonemic or whole word study to learn the forty target words, with ten words taught in each weekly intervention session. At the end of each session, participants completed posttests that were identical to the pretests to measure their word recognition, word analysis, spelling, reading vocabulary, and reading comprehension for the words that just had been taught in the session. On these within-session measures, both groups made large gains, as measured in effect sizes, for all tasks except the word analysis. Although the gains were generally larger for the morpho-phonemic group, the groups did not differ significantly on any measure other than the word analysis, extraction of base words task. The fact that both groups made large gains on nearly all tasks for taught words attests to the power of the tutoring experience. Participants received individual instruction for two hours weekly by
highly trained tutors, using structured graphic organizers to teach complex words’ pronunciations, definitions, synonyms, and spellings. Furthermore, the instruction taught civics content that, according to participants’ reports on the debriefing interview, was motivating to them as citizens and as students preparing to take high school equivalency exams.

**Why did Students in the Morpho-Phonemic Group Have Greater Gains in Word Analysis for Taught Words?**

The only within-session outcome measure on which participants differed by group was the measure of word analysis, with the morpho-phonemic group making much larger gains than the whole word group. According to an analysis of variance, that difference between the two groups on word analysis was highly significant statistically. The extraction of base words in the word analysis task was the litmus test for the presence of morpho-phonemic instruction, and the highly significant differences in gain scores clearly reflected this instructional orientation.

**Why was there greater transfer of learning on word attack and word reading after morpho-phonemic intervention than after whole word study?**

Adult struggling readers who received morpho-phonemic word study transferred their newly learned skills to the reading of new words, whereas the group who had whole word study did not. This finding showed up in the analysis of variance between groups on the standardized test scores for Word Attack and Word Recognition (See Tables 8 and 9). This finding echoes the results of Bhattacharya and Ehri (2004) who compared the effects of word learning with syllable segmentation to whole word learning for teen struggling readers. The current study contained additional layers in both the experimental and the control conditions. Those in the experimental condition were taught not only to analyze syllables, but also to analyze morphemes, through
adding base words to affixes in word sums, and phonemes, though assigning primary stress in complex words. In the control condition, readers were taught to attend closely to spellings and reflect on what made the words hard to spell. In contrast with the earlier study, readers in the present study were adult struggling readers and were taught to read the target words within the context of relevant passages, whereas the teens in Bhattacharya and Ehri’s (2004) study were not. Nonetheless, both studies compared word analysis instruction with whole word instruction and found greater transfer from the learning of taught words to the learning of untaught words when complex word parsing was taught. Thus, parsing words’ internal structures was the common denominator in the more effective treatment.

The results of the current study are also consistent with those of Alamprese et al. (2011) who found better word recognition gains in native English speaking adults than in nonnative speakers, after morpho-phonemic instruction. In the earlier study, adult readers with low to intermediate literacy skills were taught word analysis of phonemes, morphemes and spellings, as well as a metacognitive strategy for decoding complex words, using a structured decoding program based on Venezky’s (1999) study of English orthography. Those who received the structured approach made better gains in decoding or word attack \((p = .05)\) than those in the control group, who were taught the regular adult literacy program using a children’s curriculum adapted for adult use. However, both groups made small to moderate gains in literacy with no significant differences in word recognition \((p = .37)\) or spelling \((p = .10)\) (Alamprese, et al., 2011). This study extend the findings of the earlier research, with significant differences between the experimental and control groups not only in word attack gains \((p = .04)\) but also in word recognition gains \((p = .01)\). Using Alamprese et al’s (2011) impact sizes as a reference point of comparison with this study, she and her research team found similar levels of impact from the
experimental treatment, as compared with the controlled treatment, on word attack (impact = .19) as did the present study (\(d = .12\)). However, the current study found larger magnitudes of treatment gains for word reading (\(d = .19\)) than did the former study (impact = .11).

The current findings also support the results of Lovett et al. (2000) using the PHAST reading program with severely reading-disabled middle schoolers. Those who received the PHAST instruction, with its phonological analysis and synthesis, and its word identification strategies that included “peeling off” prefixes and suffixes from base words, made greater gains than those who received traditional special education instruction. Like the PHAST study, this study also provided middle school level readers with treatment focused on increasing both phonological and morphological awareness. In both the PHAST study and the current study, struggling readers made greater gains on the word level dependent measures of Word Attack and Word Identification than they did on the discourse level dependent measures of Reading Comprehension and Reading Fluency.

The fact that the present study replicates the word reading gains in the research of Bhattacharya and Ehri (2004), Alamprese (2011) and Lovett et al (2000) is of interest both clinically and theoretically. From a clinical standpoint, teaching readers to break words into syllables and to use morpho-phonemic information like base word extraction to read words leads to greater transfer of word analysis and word recognition. From a theoretical perspective, these results are notable because, according to the Lexical Quality Hypothesis (Perfetti, 2007), word attack and word recognition are the first linguistic hurdles to achieving passage comprehension. Reading comprehension depends on word attack and word recognition skills which, when inefficient, impede access to higher level skills, such as integration of semantic and syntactic information, resulting in poor reading comprehension (Perfetti, 2007). Conversely, readers have
efficient word analysis and word reading skills, when they have bonded together words’
constituent phonological, morphological and orthographic identities into “amalgamated”
orthographic images that are linguistically multi-dimensional but catalogued in readers’ lexicons
as spelling forms (Ehri & Roberts, 1979; Ehri, 1992). As a result of increased lexical quality
from this constituent binding, greater word analysis and word reading skills allow readers
unimpeded access to higher level skills like reading comprehension (Perfetti, 2007).

Adult struggling readers made greater word recognition gains from morpho-phonemic
tutoring, which included phonological elements in prosodic stress placement and pronunciation
tasks. This supports developmental views of word learning. Most participants were reading at the
late elementary to middle school level, developmentally ready to shift from a focus on decoding
to a focus on making meaning (Chall, 1983) and from focus on surface phonetic to deeper lexical
understanding of spelling (Chomsky, 1970). Both groups were successful in learning complex
words through intensive word study. However, only those who learned words’ morpho-
phonemic identities showed transfer of the learning on a standardized test of word identification.
Consistent with developmental spelling phases, the participants who received word study using
chunks of spellings, sounds and meanings, as in phoneme clusters and morphemes, got the
nourishment they required to recognize syllables, affixes, and base words at the derivational or
consolidated spelling phases (Ehri & McCormick, 1998; Templeton & Morris, 2000).

Did Outcomes Generally Reflect Treatment Emphasis?

Some results on dependent measures mirrored treatment emphases while others did not.
Morpho-phonemic treatment yielded better gains in root word analysis for the taught vocabulary
words, as base word extraction was one direct focus of that treatment. Whole word study
treatment resulted in large gains during the sessions on measures of word recognition, spelling,
vocabulary, and sentence comprehension, but not on word analysis. These findings for taught words clearly reflect the treatment foci.

However, for untaught words, the standardized literacy and vocabulary measures that measured transfer skills, group gains did not always match their treatment emphasis. One way that the gains did reflect intervention was that treatment focused on sub-lexical literacy processes lead to significantly larger gain scores on word attack and word recognition. Still, the gain scores made by the morpho-phonemic group for Letter Word ID yielded no treatment effect, given application of the decision rule stating that only effect sizes approaching magnitudes of .75 or higher would be counted as indicating significant treatment gains.

The whole word study group did not attain higher scores on dependent measures of spelling, although this was one main focus of their treatment. For example, on the Spelling subtest of the WJ-III, the spelling task that involved spelling real words, the whole word group gained less than one point from pretest to posttest, resulting in a null effect size gain. Likewise, for the Spelling of Sounds subtest of the WJ-III, the spelling task that involved spelling nonsense words, the whole word group made no gains from pretest to posttest.

**Why teach vocabulary in conjunction with word analysis to struggling readers?**

Based on the findings of this study, there are two reasons why teaching vocabulary in conjunction with word analysis is more effective than teaching vocabulary without word analysis. First, it is a more efficient use of teaching time; second, it casts a wider instructional net to reach readers with more diverse literacy needs.

Vocabulary instruction with morpho-phonemic analysis is more efficient because students can learn many more words within the same amount of teaching time. The students in this study had low vocabularies, with oral vocabulary skills ranging from the limited to very
limited range, according to the Woodcock Munoz Language Survey that was given as a screening pre-test. Low vocabulary skills such as these are typical in urban low income school districts. In this experiment, both kinds of intervention led to successful learning of the words that were directly taught, but for the group who did not learn to analyze the internal structure of those words, the learning stopped there. In their study comparing direct vocabulary teaching with incidental vocabulary learning from reading contexts, Nagy, Herman & Anderson (1985) suggest that those concerned with literacy instruction ask “What approach to vocabulary can effectively lead to the acquisition of several thousand words per year? (p. 251)… The number of words to be learned is too enormous to rely on word-by-word instruction. It follows that students must somehow become independent word learners.” (p.252) In the current study, teaching vocabulary with morpho-phonemic word study led struggling adult readers to become independent word learners, generalizing word reading skills from words they had been taught to non-instructed words. In contrast, those taught whole word vocabulary learned only the words that were taught, necessitating word by word instruction at too slow a pace for struggling readers to catch up.

Teaching morpho-phonemic word study casts a wide instructional net, reaching students who require a wide range of literacy skill development, including decoding, word recognition and vocabulary. Older readers may struggle with reading because of poor decoding and word recognition skills, as was true for 60% of middle school struggling readers in one study (Fletcher, 2007) and for adults in adult literacy classes in another study (Greenberg, Ehri & Perin, 1997). Older readers also struggle with literacy because of low vocabulary knowledge, as was the case in this study and other studies of older readers from multi-lingual home environments in urban settings. For example, one study of urban middle schoolers identified many students, from both language minority and native English backgrounds, who were “word
callers” reading words accurately without knowing their meanings (Lesaux & Kieffer, 2010). In the present study, adult readers who had morpho-phonemic vocabulary instruction demonstrated increased decoding, word identification and vocabulary skills, although vocabulary gains did not differ significantly between groups.

**What were the limitations and strengths of this study?**

Two limitations to this study involve its sample size and group comparisons. A larger sample might have detected other differences between groups at posttest, perhaps amplifying the vocabulary benefits that poor decoders had after morphological teaching. Second, because both groups were taught word study, it could have been more informative to have had a third control group without instruction. Words had been taught within the context of meaningful passages. Comparable studies placed morphological instruction within the meaningful contexts such as thematic passages with positive results.

Another limitation may involve the fact that there was a significant difference in instructional time, favoring the group who had whole word instruction. That discrepancy might have led to reduced differences between the groups teaching outcomes. Nevertheless, even greater instructional time was not sufficient to for the whole word group to overcome differences on the two transfer tasks of word attack and word reading.

A fourth limitation involved the representativeness of the sample. Those who completed the study were volunteers who had not been randomly selected, thus they might not have been typical of adults in secondary education. Those who participated reported in the debriefing interview that they needed money and wished to improve their literacy and vocabulary skills. Therefore, they may have been from a lower socio-economic status and they may have had a greater incidence of reading disabilities than typical students seeking alternative high school
diplomas. Furthermore, the fact that they were all young people from minority backgrounds limits the ability to generalize the results to populations beyond those of African American and Latino young adults.

Another weakness of the study lies in the fact that there were no differences between the groups on measures of morphological awareness itself. This may have been due to the fact that participants were not asked to complete any tasks that closely resembled the tasks they had completed in the training sessions. To be specific, one of the instructional elements for the morpho-phonemic group was to extract base words from the words they were taught, but there was no task asking participants to extract the base words from words they had not been taught. Perhaps if there had been a task measuring the extraction of base words from unfamiliar complex words, then greater gains may have resulted for that group on the Morphological Awareness Test. It is also possible that the morphological awareness for roots task did not contain enough items, rendering it insensitive to treatment effects.

The study was strong in its ability to minimize threats to internal validity. Students completed screenings to ensure minimal levels of intelligence and English language proficiency. Based on their initial reading skill levels, participants were ranked in pairs, who were randomly assigned to each treatment by the tutor delivering the instruction, so that each tutor was blind to which kind of treatment each person was receiving. Thus, tutors were blind to the treatment when they conducted the posttesting for the standardized literacy, vocabulary and civics measures. Furthermore, the research assistant was not aware of the hypotheses being tested.

The instructional design also strengthened the study, further reducing threats to validity, with parallel teaching elements delineated by semantic maps for each treatment condition. The semantic maps for each treatment shared the same visual structure and displayed many of the
same teaching elements, including the target word at the center of the map with rays leading to the definition, synonym and sentence contexts. The elements of instruction were clear to both the participants and the tutors. Differences between treatments were easily distinguishable, both visually and verbally, to the tutors, to enhance teaching clarity. Parallel structures from the semantic maps were scripted in parallel computer slideshows containing the same number of slides for each condition. Fidelity checks were facilitated as research assistants could easily check adherence to treatment by looking at whether the each element of teaching had been completed on the semantic maps.

**What are the future directions for this study and for morpho-phonemic instruction?**

Further analysis of the data from this research is planned for error analysis and subgroup comparisons. For example, did participants do better reading words that were transparent, with no sound or spelling shifts from the base word to the derived forms? Did the performance of African American students differ from the performance of Latino students at pretest or on gain scores?

The civics tasks beg further analysis as well. Both groups made small gains on the test of civic knowledge, the dependent measure of the civics content that was taught. However, the questions for this task were at a high school reading level, far above the reading levels of many of the participants. Perhaps questions written at a lower reading level would have enabled the test-takers to better demonstrate their increased civic knowledge after the teaching. Both groups made enormous gains for projected civic engagement, but the group who received whole word study made significantly greater gains in their projected electoral activities. This could be further examined by following up with participants to have them complete the Civic Engagement Quiz again, to see whether their own projections of increased voting behaviors actually came to pass.
Future studies are needed to pinpoint exactly which instructional elements of morpho-phonemic instruction are most effective to struggling readers. This research offered a kind of blitz of morpho-phonemic tools for complex word learning, yet it was not possible to compare the effectiveness of each element. Although it appeared that the parsing of morphemes and syllables within the word sums and syllabification tasks were highly effective, future studies are required to isolate which parts of the teaching worked best. This can be accomplished by offering two treatments in morpho-phonemic teaching, and varying the teaching element of interest. For example, one treatment could provide parsing of syllables and morphemes but no assignment of primary stress, to compare with another treatment that includes parsing of syllables and morphemes but no assignment of primary stress. Greater morpho-phonological accuracy may result from the treatment that includes assignment of primary stress, thereby leading to greater accuracy in pronouncing complex words, especially those whose base words undergo sound or spelling shifts from their derived forms (Jarmulowicz et al., 2008). Such studies could reveal how morphological instruction interfaces with other kinds of written language knowledge, including phonological, semantic, orthographic, and prosodic awareness.

The current study could be extended to the teaching of teens in high school, to focus on increasing literacy skills before students’ sense of academic failure leads them to drop out. It is encouraging that the young adult struggling readers in this study showed measurable gains on standardized tests after only four weekly sessions of intensive tutoring. Perhaps teens given morpho-phonemic teaching could make even greater literacy gains than young adults, given that their brains continue to develop throughout adolescence. With implementation of the Common Core State Standards, morpho-phonemic instruction is likely to produce greater knowledge of
academic vocabulary, and greater outcomes on tests measuring the effectiveness of those teaching standards.

**Conclusion**

This study reports significantly greater adult literacy gains on word attack and word recognition after morpho-phonemic instruction with word analysis than after rich, in-depth word study using whole words without word analysis. Greater gains on higher level literacy skills were not evident after short-term morpho-phonemic teaching as compared with whole word teaching, according to measures of reading vocabulary and reading comprehension. As predicted by the authors of one recent meta-analysis of the effects of teaching morphological awareness on literacy, benefits to reading occurred in multiple linguistic layers (Bowers, Kirby & Deacon, 2010). The first layer of benefit occurred at the lowest sub-lexical layer, as increased word analysis skills helped these adult struggling readers better analyze unfamiliar words. Increased word analysis skills also transferred to the higher linguistic layer of lexical content, resulting in greater word recognition skills. For these young adults with only 8 hours of morpho-phonemic tutoring, issued in two hour weekly sessions for 4 weeks, increased word recognition did not transfer to the highest, supra-lexical layer of reading comprehension. Gains at that layer are expected to be less direct and to require long-term integration of increased morphological awareness with other aspects of literacy, according to Bowers, Kirby and Deacon (2010).

Overall, the results present a complicated picture of literacy of adults in secondary education. On the negative side, these learners’ very low reading and vocabulary skills indicate the need for intensive language instruction, which is neither available nor affordable to them. On the positive side, perhaps because these adults had never received explicit literacy tutoring before, there was a freshness in their response to intervention, as seen in the sizable learning
outcomes not only on measures of word learning, but also on measures of civic content and projected civic engagement.

In summary, young adult struggling readers succeeded in learning up to 40 academic vocabulary words after both morph-phonemic word study with word analysis and rich vocabulary instruction without word analysis. However, only the group given morpho-phonemic instruction transferred the learning to the reading of new words, thereby increasing their word reading skills. Thus, vocabulary teaching with analysis of morphemic-phonemic-orthographic word structures is more efficient than vocabulary teaching without word analysis. This is especially true for educationally disadvantaged adults in urban settings, who require exponentially greater vocabulary knowledge in order to succeed in secondary and post-secondary education and find meaningful employment that enhances their quality of life.
Appendix A.

**Academic Vocabulary Words taught within tutoring sessions**

<table>
<thead>
<tr>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) republicanism</td>
<td>11) incriminate</td>
<td>21) suffragists</td>
<td>31) destiny</td>
</tr>
<tr>
<td>2) virtuous</td>
<td>12) emancipation</td>
<td>22) amendment</td>
<td>32) disobedience</td>
</tr>
<tr>
<td>3) philosophers</td>
<td>13) proclamation</td>
<td>23) adoption</td>
<td>33) nonviolent</td>
</tr>
<tr>
<td>4) inalienable</td>
<td>14) ratified</td>
<td>24) justices</td>
<td>34) segregated</td>
</tr>
<tr>
<td>5) intolerant</td>
<td>15) drafted</td>
<td>25) commonwealths</td>
<td>35) constitutionality</td>
</tr>
<tr>
<td>6) restrictions</td>
<td>16) abridges</td>
<td>26) adapted</td>
<td>36) citizenry</td>
</tr>
<tr>
<td>7) grievances</td>
<td>17) immunities</td>
<td>27) sovereignty</td>
<td>37) sponsoring</td>
</tr>
<tr>
<td>8) petitioning</td>
<td>18) equality</td>
<td>28) enlightened</td>
<td>38) environmental</td>
</tr>
<tr>
<td>9) seizures</td>
<td>19) servitude</td>
<td>29) prosecution</td>
<td>39) commitment</td>
</tr>
<tr>
<td>10) warrants</td>
<td>20) abolitionists</td>
<td>30) engagement</td>
<td>40) aspirations</td>
</tr>
</tbody>
</table>
Appendix B.

Sample Scripts for morpho-phonemic and whole word tutoring

Sample Slideshow (PowerPoint) Script for morpho-phonemic tutoring

Slide 1.

[The first slide matches the printed version in the participant’s worksheet binder, so s/he can fill out the worksheet following the prompts in the slideshow script.]

Slide 2.

Read the word.

nonviolent

If you don’t know the word, listen while I read it.

Read the word.

Slide 3.
Read aloud the definition of the word.

*not using or involving violence*

If you cannot read it, listen while I read it.

Read aloud the definition.

Slide 4.

Read the synonym, a word that means the same thing.

*peaceful*

If you cannot read it, listen while I read it.

Read aloud the synonym.

Write the synonym.

Slide 5.

Now read aloud a sentence with the word in it.

*Martin Luther King spoke about racial equality at a huge, nonviolent march in Washington D.C.*

If you cannot read it, listen while I read it.

Read aloud the sentence.

Slide 6.

Most English words come from Latin and Greek root words.

Read aloud the word origin for this word.

*Latin violentus = strength*

*English base = violent*

If you cannot read it, listen while I read it.

Write the word origin and its meaning.
Slide 7.

Meaningful word parts (called morphemes) can be added together to make new words. The base word can stand alone.

Read and write the word sum here.

non + violent = nonviolent

Circle the base word.

Slide 8.

Did the spelling of the base word change when the affixes were added? Tell how.

Did the pronunciation of the base word change when the affixes were added? Tell how.

Slide 9.

Suffixes can change the part of speech of the base word.

Did the part of speech change? Write the role of the suffix.

Slide 10.

Words with the same root can have similar spellings, meanings and pronunciations.

Read these two words that share the same root as the vocabulary word.

violence

violently

Write the words with shared roots.

Circle the base words.

Slide 11.
A syllable has one beat and one vowel sound.

Clap out [tapping out on the table was acceptable, too] the syllables in the vocabulary word.

Scoop out the syllables in the word.

*non vi o lent*

[Any syllable divisions with one beat and one vowel sound were acceptable]

Slide 12.

Which syllable has the stress, meaning the loudest or highest sound?

Underline the syllable with the stress.

*non vi o lent*

Slide 13.

Each slide contained a photograph and a printed passage with about 3-5 complex sentences, from a high school civics lesson that contained the target vocabulary word, to be read aloud collaboratively with the participant and tutor taking turns, as in a responsive reading. At the start of the treatment, participants received instructions that s/he would read aloud the sentences written in black type, and the tutor would read aloud the sentences written in brown type. Any errors on words or lengthy pauses were immediately corrected or supplied by the tutor. In accordance with the copyright permission granted from the Center for Civic Education (copyright 2009 (ISBN: 0-898-18-232-3), the passages and photographs that were used in the PowerPoint slideshow are not reprinted here.
Sample Slideshow (PowerPoint) Script for whole word tutoring

Slide 1.

[The first slide matches the printed version in the participant’s worksheet binder, so s/he can fill out the worksheet following the prompts in the slideshow script.]

Slide 2.

Read the word.

*nonviolent*

If you don’t know the word, listen while I read it.

Read the word.

Slide 3.

Read aloud the definition of the word.

*Not using or involving violence*

If you cannot read it, listen while I read it.
Read aloud the definition.

Slide 4.

Now read a sentence with the word in it.

*Martin Luther King spoke about racial equality at a huge nonviolent march in Washington D.C.*

If you cannot read it, listen while I read it.

Read aloud the sentence.

Slide 5.

Now read the other sentence with the word in it, about a young adult.

*The group of college students had a nonviolent march to protest the war.*

If you cannot read it, listen while I read it.

Read aloud the second sentence.

Slide 6.

Read the synonym, a word that means the same.

*Peaceful*

If you cannot read it listen while I read it.

Read aloud the synonym.

Write the synonym.

Slide 7.

What role does this word play in sentences?

Is it a noun, verb, adjective or adverb?

Why do you think so?

If you don’t know, let’s think again about how words play different roles in sentences.
[If necessary, show the part of speech prompt card]

Write the part of speech for the word.

_Slide 8._

What other word does this word make you think of and why?

Write the other related word that this word makes you think of and why.

_Slide 9._

Write the spelling of the word.

[Participant is looking at the word while s/he writes it in the worksheet]

_Slide 10._

Count the letters in the word.

Write the number of letters here.

Read the words again.

Name the letters you see in the words.

Listen to me as I name the letters.

_Slide 11._

Look at the word, then close your eyes and try to picture the word in your mind.

Visualize the word.

Open your eyes and try to write the word from memory.

Look at the word to check your spelling and make any corrections.

Write the word again from memory.

Now check it and make any corrections.

_Slide 12._

Here are some reasons why words can be hard to spell:
-Double letters
-Silent letters
-Hard to hear letters
-Surprising letters

Write what made this word hard to spell and tell me.

Slide 13.

Each slide contained a photograph and a printed passage with about 3-5 complex sentences, from a high school civics lesson that contained the target vocabulary word, to be read aloud collaboratively with the participant and tutor taking turns, as in a responsive reading. At the start of the treatment, participants received instructions that s/he would read aloud the sentences written in black type, and the tutor would read aloud the sentences written in brown type. Any errors on words or lengthy pauses were immediately corrected or supplied by the tutor. In accordance with the copyright permission granted from the Center for Civic Education (copyright 2009 (ISBN: 0-898-18-232-3), the passages and photographs that were used in the PowerPoint slideshow are not reprinted here.
**Appendix C.**

**Word Knowledge Morphological Awareness Test**

Participant: __________________  Date: _________________ Pretest or posttest?

**WORD PARTS-RIGHTS** (Bellomo, 2009) For each of the italicized word parts, choose the correct definition/synonym from the four given options.

<table>
<thead>
<tr>
<th>TRIAL: vis (visible)</th>
<th>a) see</th>
<th>b) eat</th>
<th>c) find</th>
<th>d) drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) cap/capt</td>
<td>a) rug</td>
<td>b) keep</td>
<td>c) head</td>
<td>d) truth</td>
</tr>
<tr>
<td>2) bene</td>
<td>a) old</td>
<td>b) good</td>
<td>c) false</td>
<td>d) humorous</td>
</tr>
<tr>
<td>3) dict</td>
<td>a) alphabet</td>
<td>b) copy</td>
<td>c) short</td>
<td>d) speak</td>
</tr>
<tr>
<td>4) scrib</td>
<td>a) work</td>
<td>b) write</td>
<td>c) shout</td>
<td>d) fast</td>
</tr>
<tr>
<td>5) man/manu</td>
<td>a) hand</td>
<td>b) horse</td>
<td>c) masculine</td>
<td>d) intelligent</td>
</tr>
<tr>
<td>6) ject</td>
<td>a) handsome</td>
<td>b) throw</td>
<td>c) foolish</td>
<td>d) outward</td>
</tr>
<tr>
<td>7) vit/viv</td>
<td>a) alive</td>
<td>b) two</td>
<td>c) speech</td>
<td>d) right</td>
</tr>
<tr>
<td>8) noc; nox</td>
<td>a) sick</td>
<td>b) nose</td>
<td>c) sad</td>
<td>d) night</td>
</tr>
<tr>
<td>9) vac; vox</td>
<td>a) kiss</td>
<td>b) fast</td>
<td>c) voice</td>
<td>d) short</td>
</tr>
<tr>
<td>10) cred</td>
<td>a) belief</td>
<td>b) government</td>
<td>c) card</td>
<td>d) lost</td>
</tr>
</tbody>
</table>

**VOCABULARY** (Bellomo, 2009): Choose the correct definition or synonym (a, b, c, or d) that best depicts the meaning of the italicized vocabulary word.

<table>
<thead>
<tr>
<th>TRIAL: dictate</th>
<th>a) say or tell</th>
<th>b) leave</th>
<th>c) clean</th>
<th>d) smell</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. magnanimous</td>
<td>a) not happy</td>
<td>b) strong</td>
<td>c) generous</td>
<td>d) book smart</td>
</tr>
<tr>
<td>2. gratify</td>
<td>a) to grow</td>
<td>b) to please</td>
<td>c) to lie</td>
<td>d) to fight</td>
</tr>
<tr>
<td>3. spectacle</td>
<td>a) lost in space</td>
<td>b) falling star</td>
<td>c) a show</td>
<td>d) of little value</td>
</tr>
<tr>
<td>4. fidelity</td>
<td>a) trusted</td>
<td>b) finances</td>
<td>c) war hero</td>
<td>d) disorder</td>
</tr>
<tr>
<td>5. pedestrian</td>
<td>a) a walker</td>
<td>b) politically incorrect</td>
<td>c) politically correct</td>
<td>d) a wheel</td>
</tr>
<tr>
<td>6. vociferous</td>
<td>a) weak-minded</td>
<td>b) easy</td>
<td>c) difficult</td>
<td>d) loud outcry</td>
</tr>
<tr>
<td>7. parity</td>
<td>a) festivity</td>
<td>b) lightness (weight)</td>
<td>c) shortness (distance)</td>
<td>d) fairness</td>
</tr>
<tr>
<td>8. potent</td>
<td>a) angry</td>
<td>b) pretty</td>
<td>c) powerful</td>
<td>d) ugly</td>
</tr>
<tr>
<td>9. vivacious</td>
<td>a) funny</td>
<td>b) not honest</td>
<td>c) lively</td>
<td>d) always late</td>
</tr>
</tbody>
</table>
10. retrospect  a) to look back  b) dust particle  c) sleep often  d) to retire
11. unanimous  a) hateful of animals  b) kind to animals  c) suspicious  d) all agree
12. herbicide  a) little energy  b) kills plants  c) extreme illness  d) talkative
13. ambivalent  a) two arms  b) conflicting feelings  c) loving; romantic  d) violent
14. gregarious  a) talkative  b) gracious  c) dangerous  d) sociable
15. omniscient  a) lover of science  b) everywhere  c) all knowing  d) egg-shaped

SENTENCE CHOICE (Mahony, 1994) Each of the next 27 sentences contains a blank and is followed by four words. Each word of the four words has the same root (base) with a different suffix (ending). For each sentence circle the word which best fits in the blank.

TRIAL: John wants to make a good _______________ on his date.

1. Fortunately, age improved his _______________.

2. My assistant will _______________ the new procedure.

3. The secret police arrested the _______________ before he could give his speech.

4. They _______________ those fields early in the spring.

5. John didn't anticipate the harshly _______________ response to his work.

6. The committee was not persuaded by the arguments of the _______________.

7. Frank broke down under the highly _______________ questioning.

8. The _______________ of the geese was complete by Thanksgiving.

9. The success of the entire _______________ depends on Bob.

10. All four studies produced nearly _______________ results.
11. They ____________ their own desires at the expense of the group.
   a) gratification   b) gratify   c) gratuity   d) grateful

12. Three separate agencies ____________ the traffic in that sector.
   a) regular   b) regularity   c) regulation   d) regulate

13. They hope to ____________ their investments.
   a) diversity   b) diversion   c) diversify   d) diversionary

14. It is impossible to ____________ people's thoughts.
   a) legislate   b) legislative   c) legislature   d) legislation

15. The ____________ of their approach prevented many errors.
   a) systematic   b) systematicity   c) systematize   d) systematically

16. The cost of ____________ keeps going up.
   a) electric   b) electrify   c) electrical   d) electricity

17. His consistently ____________ behavior eventually destroyed his family.
   a) adultery   b) adulterate   c) adulterous   d) adulterousness

18. They should ____________ that room if they plan to grow orchids in there.
   a) humidity   b) humid   c) humidifier   d) humidify

19. Only the most ____________ males survived the winter.
   a) activity   b) active   c) activation   d) activate

20. You can't ____________ results from studies done only on rats.
   a) generalization   b) generality   c) generalize   d) generalizable

21. The new owners turned the failing business into a highly ____________ one.
   a) production   b) produce   c) productive   d) productivity

22. The ____________ targeted the new administration.
   a) satiric   b) satirical   c) satirist   d) satirize

23. They planned to ____________ the entire southern coast.
   a) colonist   b) colonize   c) colonial   d) colonization

24. Only the most ____________ farmers showed any profit that year.
   a) industrious   b) industry   c) industrialize   d) industrialization

25. Continued food shortages finally caused the ____________ to revolt.
26. It was an overwhelmingly ______________ conclusion.
   a) glorify     b) glorification    c) gloriousness     d) glorious

27. We all appreciate the tremendously ______________ part you played in securing the grant.
   a) instrumental b) instrumentation c) instrumentality d) instrument

**TEST OF MORPHOLOGICAL STRUCTURE - DERIVATION**

From Ellie Clin, Lesly Wade-Woolley*, Lindsay Heggie, 2009 (Adapted from Carlisle, 1988). Type of shift (from base to derived form) is written after correct response.

Change the word on the left so that it makes sense in the sentence that follows it. Use another form of the same word on the left to complete the sentence that follows it.

**Farm**
My uncle is a ____________. [farmer] Practice

**Care**
When you’re near a hot stove, you have to be ______________. Practice

1. He cared about his ______________.
2. If you’re having trouble, the teacher will give you ______________.
3. The favorite type of music is ______________.
4. The steep cliff was very ______________.
5. The twins are identical; I can’t tell the ______________.
6. City Hall is an example of Kingston’s ______________.
7. All that candy was bad for my ______________.
8. We sat down to have a long ______________.
9. She won the school’s ______________.
10. He read the story with ______________.
11. The fire was started ______________.
12. The chess player’s position was ______________.
13. The superhero used his powers to help save ______________.
14. She was well known because of her ______________.
15. Compared to that one, this brand of car is ______________.
16. His speech in front of the White House made him look ______________.
Product 17. The factory had to shut down ________________.

Progress 18. Once he started practicing, we saw a noticeable ________________.

Public 19. Famous people receive lots of ________________.

Resign 20. I would like to hand in my ________________.

WORD RECOGNITION- SET A (Mahony, 1995) Read these words aloud.

personality demonstrate activist fertilize

critical reductionist intensive migration

operation identical gratify regulate

diversify legislate systematicity electricity

adulterous humidify active generalize

productive satirist colonize industrious

population glorious instrumental

WORD RECOGNITION- SET B (adapted from Carlisle, 1988) Read these words aloud.

assistance classical dangerous difference

enjoyment eraser honesty profitable

remarkable royalty architecture attraction

collection construction correction departure

digestion discussion election expression

protection accidental advantageous artistic

dramatic equality honesty majority

personality popularity superior elasticity

electricity European magician musician

perfection presidential production progression

publicity resignation

WORD RECOGNITION SET C (Gray): Read these words aloud.
1. magnanimity       2. gratification
3. spectacular       4. retrospective
5. unanimity         6. herbicidal
7. philanthropic     8. autobiographical
9. atmospheric       10. anachronistic
Appendix D.

Recruitment Advertisement

Reading and Spelling Study Participants Needed!

What: Free Tutoring in Reading/Spelling Lessons

Time: Pre-screening Stage: Phone Interview
Stage 1 (Screening Stage): You get $25 for the Screening Stage Stage 2 (Tutoring Stage): You get $12/ hour for 2 hours/week for 4 weeks plus a $40 BONUS if you complete the study

Place: At or near your GED site or CUNY college campus

- Are you 18-30 years of age?
- Are you enrolled in a GED course?
- Is English one of your first languages?

If you answered yes to these questions, you may qualify to participate. In the Pre-Screening stage, you will complete a Phone Interview to determine whether you are eligible to participate in the Screening Stage. In the Screening Stage, you will be paid $25 to complete about two hours of tests in language, reading and cognition. Based on the results of the screening, you may qualify to continue with the Tutoring Stage (2 hours per week for 4 weeks). During the Tutoring Stage, you will be paid $12 per hour with a $40 BONUS if you complete the whole study.

The purpose of this study is to learn which kinds of teaching work best for adult readers. Please call Susan at [phone].

Appendix E.
Phone Interview

Name: _______________________________  Phone Number: ______________________

Email (optional): _______________________________  Date of Birth: ______________________

Last Grade Completed: _______________________

1. How old are you?
2. What was the first language you spoke? Do you speak any other languages?
2B. At what age did you begin to learn English?
3. Are you enrolled in a GED course?  3B. Which course?
4. Have you ever had difficulty with reading or spelling?  When?
5. Have you ever had a head injury or serious illness that required hospitalization?
6. Have you ever had cognitive, neurological, hearing or vision problems?
7. Have you ever been diagnosed with dyslexia or a reading disability? (When? Where?)
8. Have you ever been diagnosed with Attention Deficit Disorder? (When? Where? Medication?)
9. Have you ever received special instruction in the following:
   Speech or language therapy?
   Reading, spelling or writing?
   Ages, duration, effectiveness?
10. How many books did you read last month?
11. How many books did you read for pleasure last summer?
12. How much time do you spend reading each day?  In an average month?
13. What kind of materials do you read most often?
14. What are or what were the occupations of your parent or parents?

Appendix F.
Consent Form
You are being asked to volunteer to be in a study of reading and spelling instruction. You may choose whether or not you wish to participate. If you choose to participate, you may decide to stop at any time. My name is Susan Gray and I am a doctoral candidate in the Speech-Language-Hearing Sciences program at The CUNY Graduate Center in New York City. I am the principal investigator for this project studying two different approaches to reading and spelling for GED and college adults. The study has two stages: the Screening Stage and the Tutoring Stage. In the Screening Stage, you will be paid $25 to complete 2 hours of reading, language and cognitive tests to see if you are eligible to continue with the Tutoring Stage of the study. If you qualify for the Tutoring Stage, you will be paid $12 per hour to complete 8 hours of tutoring, with reading and spelling tests at the beginning and at the end of the study. If you complete the entire study, including the Screening and the Tutoring Stages, you will receive an additional $40 bonus. There will be about 30-50 participants in this study.

All tutoring and testing will be tape-recorded. All information gathered for the study will be kept confidential, and stored in a file cabinet in the locked office of my advisor, Dr. John Locke. You may have the results of your reading and language tests and ask questions about them if you wish. The risk involved in this study is no more than the risk you would encounter in everyday life. One direct benefit is that you may receive instruction in reading and spelling skills. The second benefit is that you will help researchers understand better how to teach reading and spelling to GED students.

If the results of this study are published, the names of people and any identifying information will not be used. If you would like a copy of any published study, please provide me with your address below. The data from this project will be kept in a locked file. If you have questions, please contact Susan Gray at XXX-XXX-XXXX or by email XXXXX. My advisor, Dr. John Locke, can be reached at XXX-XXX-XXXX or by email at XXXXX. If you have concerns about your rights in this study, you can contact the IRB Administrator, at XXX-XXX-XXXX or by email at XXXXX.

I have read and understand this consent form and agree to participate in this study.

____________________  _______   _________________ ____  ________
Participant’s Signature  Date  Investigator’s Signature  Date

May we contact you for follow-up questions or retesting?  YES ____  NO ____
May we contact you about participating in another study?  YES ____  NO ____
May we have permission to obtain GED or other test results from your GED program?  YES ____  NO ____

E-mail: __________________________________  Phone: _________________________
Home: _________________________________________________________________________

Appendix G.
Civic Engagement Quiz (Pretest)


Civic engagement quiz—full version.

For a more complete discussion on administering the quiz, see the accompanying guide called “A Guide to the Index of Civic and Political Engagement” (2003).

Please mark an “X” in the appropriate box(es). Once completed, use the tables on pages 5 and 6 to compare your responses to those of a nationally representative sample.

Civic Indicators

<table>
<thead>
<tr>
<th>Community Problem Solving</th>
<th>( ) Yes, Within the last 12 months</th>
<th>( ) Yes, But not within the last 12 months</th>
<th>( ) No, Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you ever worked together with someone or some group to solve a problem in the community where you live?</td>
<td>( ) Yes, Within the last 12 months</td>
<td>( ) Yes, But not within the last 12 months</td>
<td>( ) No, Never</td>
</tr>
</tbody>
</table>

Volunteering

<table>
<thead>
<tr>
<th>( ) Yes, Within the last 12 months</th>
<th>( ) Yes, But not within the last 12 months</th>
<th>( ) No, Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Have you volunteered or done any voluntary community service for no pay?</td>
<td>( ) Yes, Within the last 12 months</td>
<td>( ) Yes, But not within the last 12 months</td>
</tr>
</tbody>
</table>

Indicate whether you have volunteered with any of the following types of organizations or groups:

<table>
<thead>
<tr>
<th>2A. Religious group</th>
<th>( ) Yes, I have volunteered within the last 12 months</th>
<th>( ) Yes, I volunteer once a month or more</th>
<th>( ) Not within the last 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B. Environmental organization</td>
<td>( ) Yes, I have volunteered within the last 12 months</td>
<td>( ) Yes, I volunteer once a month or more</td>
<td>( ) Not within the last 12 months</td>
</tr>
<tr>
<td>2C. Civic or community organization involved in health or social services</td>
<td>( ) Yes, I have volunteered within the last 12 months</td>
<td>( ) Yes, I volunteer once a month or more</td>
<td>( ) Not within the last 12 months</td>
</tr>
<tr>
<td>2D. An organization for youth, children, or education</td>
<td>( ) Yes, I have volunteered within the last 12 months</td>
<td>( ) Yes, I volunteer once a month or more</td>
<td>( ) Not within the last 12 months</td>
</tr>
</tbody>
</table>
### Group Membership

3A. Do you belong to or donate money to any groups or associations, either locally or nationally such as charities, labor unions, professional associations, political or social groups, sports or youth groups, and so forth?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) Active member of at least one of them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) Member, but not active in at least one of them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) Given money only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3B. Are you an active member of this group or any of these groups, a member but not active, or have you given money only? Mark all that apply.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) Active member of at least one of them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) Member, but not active in at least one of them</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) Given money only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Participate in run/walk/ride

4. Have you personally walked, ran, or bicycled for a charitable cause – this is separate from sponsoring or giving money to this type of event?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) Yes, Have done it within last 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) Yes, But not within last 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) No, Never</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Donate to a charity

5. Besides donating money, have you ever done anything else to help raise money for a charitable cause?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>( ) Yes, Have done it within last 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) Yes, But not within last 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( ) No, Never</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Electoral Indicators

**Voter Registration**

6A. Many people are not registered to vote because they are too busy or move around often.

<table>
<thead>
<tr>
<th></th>
<th>Yes, Definitely</th>
<th>I think so</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you currently registered in your election district, or not?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Voting**

6B. We know that most people don’t vote in all elections. Do you vote in both national and local elections?

<table>
<thead>
<tr>
<th></th>
<th>Yes, Always</th>
<th>Yes, Usually</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Volunteer for a Candidate or Political Campaign**

7. Have you volunteered for a political organization or candidate running for office?

<table>
<thead>
<tr>
<th></th>
<th>Yes, Within the last 12 months</th>
<th>Yes, But, not within the last 12 months</th>
<th>No, Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persuade Others to vote for a candidate or party</td>
<td>Yes, Always</td>
<td>Yes, Usually</td>
<td>No</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------</td>
<td>--------------</td>
<td>----</td>
</tr>
<tr>
<td>8. When there is an election taking place, do you try to convince people to vote for or against one of the parties or candidates, or not?</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display Campaign Button or Sticker</th>
<th>Yes, Always</th>
<th>Yes, Usually</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Do you wear a campaign button, put a sticker on your car, or place a sign in front of your house?</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contributing to a Campaign, party or group</th>
<th>Yes, Within the last 12 months</th>
<th>Yes, But, not within the last 12 months</th>
<th>No, Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Have you given money to a candidate, political party, or organization that supported candidates?</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>
Appendix H. Debriefing Interview

Participant Number: __________

Date of Interview: __________

Thank you so much for your participation in this study of reading and civics knowledge in young adult GED students!

1. Did you find this kind of teaching helpful? Why or why not?

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

2. Have you ever had this kind of instruction before? If so, when?

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

3. What are your educational plans for the future? Did being in this study influence your plans?

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

4. May we contact you again in the future to do a check up of your reading skills or civics knowledge or to participate in another study?

_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________


Appendix I


Submitted List Summary Characteristics:
Your list contained 41 words, of which 38 are distinct.

<table>
<thead>
<tr>
<th>Mean Freq_KF</th>
<th>Mean SUBTLWF</th>
<th>Mean NMorph</th>
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</thead>
<tbody>
<tr>
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<td>9.406</td>
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Individual Item Characteristics:

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# Environmental

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<th>Score</th>
<th>Type</th>
<th>Flex</th>
<th>POS</th>
<th>Count</th>
<th>Score</th>
<th>Type</th>
<th>Flex</th>
<th>POS</th>
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<td>NN</td>
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Appendix J. Letter of Permission for Excerpts from civics passages

Dear Susan:


This permission covers the following portions of *We the People*: Pages 12, 13, 14, 15, 16, 17, 18, 20, 21, 23, 106, 108, 115, 116, 120, 121, 122, 124, 125, 130, 131, 132, 137, 138, 139, 149, 150, 156, 157, 186, 189, 190, 226, 230, 231; also, scattered paragraphs or sentences from Unit 6: Lessons 33, 34, 35; various cartoons.

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Credit line to be used:

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Thank you for your interest in the work of the Center. Please do not hesitate to contact me with any additional questions.

Best regards,

Mark Gage

--

Director of Publishing and Digital Content
Center for Civic Education
gage@civiced.org
p. 818-591-9321
Bibliography:


Henry, M.K. (2010). *WORDS: Integrated decoding and spelling instruction based on word origin and word structure (2nd Ed.).* Austin, TX: PRO-ED.


**Websites:**

[http://www.corestandards.org/other-resources](http://www.corestandards.org/other-resources)


[http://www.uccs.edu/~lbecker/](http://www.uccs.edu/~lbecker/)
Autobiographical Statement

Susan H. Gray teaches and supervises graduate students in the Speech, Language and Literacy Center of the Department of Communication Sciences and Disorders at the MGH Institute of Health Professions in Boston. She is studying interventions that link words’ sound, meaning and spelling structures to increase literacy through word knowledge, especially for learners from low income and minority language backgrounds.

Dr. Gray earned her Ph.D. from the CUNY Graduate Center in New York City in Speech-Language-Hearing Sciences. Her dissertation proposal, “Adult Literacy and Citizenship: Empowering Adult Struggling Readers with Word Study and Civics” won the 2013 Jeanne S. Chall Fellowship, a grant given by the International Reading Association to support reading research by promising scholars. She also received a 2013 Graduate Student Scholarship from the American Speech-Language-Hearing Association Foundation for outstanding academic achievement. Both sources of funding supported this dissertation project.

Susan Gray is a certified teacher, reading specialist, and speech-language pathologist who has worked extensively in both hospital and school settings. From Boston University she holds both a B.S. in Elementary Education and an M.S. in Communication Disorders. At the Harvard Graduate School of Education, she studied with Jeanne Chall and Carol Chomsky, earning an M.Ed. in Reading/Language.

The central idea for this research came from one of Carol Chomsky’s Linguistics classes at the Harvard Graduate School of Education in 1985.