The impact of morphological instruction on morphological awareness and reading comprehension of EFL learners

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Abstract: Awareness in derivational morphology is the ability to manipulate derived words, recognize relationships between different morphological forms of a word, and produce new derivations of words. The current study attempted to investigate the impact of morphological instruction on awareness in relational, syntactic and distributional aspects of derivational morphology, and in turn its effects on reading comprehension among intermediate EFL learners. The participants were 129 lower–higher intermediate students, randomly assigned into experimental and control groups. The study had a pretest-posttest quasi-experimental control group design. The results demonstrated that the experimental groups outperformed the control groups on all three tasks assessing aspects of derivational morphology and reading comprehension tests demonstrating the positive effects of morphological instruction. The treatment benefited the higher level to a greater degree in reading comprehension, but concerning aspects of derivational morphology, the lower level had better improvements. It is concluded that the treatment is more effective for lower levels of proficiency at sub-lexical, but concerning higher levels of proficiency, it is more beneficial at supra-lexical level. The results also demonstrate that reading comprehension improvements were more pronounced for lower proficiency levels, while the higher levels benefited more from the supra-lexical aspects of morphological awareness.

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PUBLIC INTEREST STATEMENT
In recent times with the arrival of the communicative trends, the learning and teaching of languages no longer focuses on the description of the language itself but on language as a means of communication. Concerning word structure, little emphasis is given to morphological issues and this has led to an undesirable disregard for the internal structure of words. Majority of English words have been made through combinations of morphological elements such as prefixes and suffixes with base words. If learners understand how this combinatorial process works, they possess one of the most powerful understandings necessary for vocabulary growth. Morphological awareness of words can influence literacy at lexical level such as word reading, spelling and vocabulary and levels beyond word level, such as reading comprehension. The present study aims to investigate the impact of morphological instruction on awareness in aspects of derivational morphology among EFL learners and how this awareness can in turn affect their reading comprehension.
comprehension is correlated with aspects of derivational morphology and the strongest correlation was observed with distributional aspect.

**Subjects:** Language & Linguistics; Language Teaching & Learning; English

**Keywords:** derivational morphological awareness; explicit morphological instruction; relational; syntactic and distributional aspects of derivational morphology; reading comprehension; EFL learners

1. Introduction

In linguistics, morphology is defined as the study of internal structures of words and word formation processes (Carlisle, Goodwin, & Nagy, 2013). Morphological knowledge refers to correctly employing morphological units which may be without conscious awareness (Yucel-Koc, 2015), but morphological awareness is defined as “the ability to reflect on, analyze and manipulate the morphemic elements in words” (Carlisle, McBride-Chang, Nagy, & Nunes, 2010, p. 466) and this is conscious awareness. Morphological instruction aims at improving morphological awareness or the conscious awareness of morphemic structures. Researchers have emphasized the need for morphological instruction in language literacy (Fracasso, Bangs, & Binder, 2016; McLeod & Apel, 2015). This is due to the fact that, by its nature, morphological instruction addresses sub-lexical features of a language, but this can influence literacy skills at lexical level such as word reading, spelling, and vocabulary and supra-lexical level such as reading comprehension and writing (Brimo, 2016).

1.1. Morphological awareness and reading comprehension

Vocabulary knowledge (i.e., knowledge of word meanings) and morphological awareness are the two language skills hypothesized to be essential in reading comprehension. According to Nation (2001), vocabulary and reading are closely related and with an increase in vocabulary growth, growth in reading skill is also observed. This holds for both native learners and EFL/ESL learners (Proctor, Carlo, August, & Snow, 2005). According to Zhang and Koda (2012), morphological awareness contributes to L2 vocabulary knowledge directly and indirectly through the mediation of students’ lexical inferencing ability. The indirect effect of morphological awareness on reading comprehension is significant, both through the mediation of lexical inferencing ability and vocabulary knowledge.

Limited vocabulary knowledge is a major source of reading comprehension difficulties (August & Shanahan, 2006). According to Nagy and Townsend (2012), academic vocabulary is a vital tool necessary for increasing academic achievement. English academic vocabulary consists of words usually having Greek and Latin origin with a morphologically complex structure. Crosson, McKeown, Moore, and Ye (2018) state that instruction of academic vocabulary with Latin origin and morphologically complex structure using morphological analysis will enhance word learning of English language learners. According to them, such instruction produces better outcomes for learning academic words by strengthening semantic and orthographic representations and affects lexical access. A growing body of literature suggests that a limited breadth of vocabulary knowledge (i.e., limited number of words known) is the most common source of reading comprehension difficulties among learners (Droop & Verhoeven, 2003).

According to Carlisle (2003), words are usually made up of smaller recognizable units called morphemes. Knowing what a morpheme means helps one to understand or guess the meaning of new words. Morphological awareness helps to decode the words, infer their meaning, and facilitate both word reading and understanding of words in texts. Word recognition is a critical part of reading (Adams, 1990). The faster one recognizes the words, the more fluent reader s/he becomes (Yucel-Koc, 2015). Derivational Morphological awareness can help with automatic word recognition. Less frequently occurring words such as academic words can be accessed by segmenting them into morphemes. If learners have morphological awareness, they should be able to access words with decoding. This can
help in recognizing the words more easily and quickly. Nagy, Beminger, Abbott, and Vaughan (2003) mentioned the role of morphological awareness in reading through enabling readers to read longer words more accurately and fluently. This awareness contributes to their word recognition, word reading and reading comprehension. Levesque, Kieffer, and Deacon (2017) state that direct and indirect relationships exist between morphological awareness and reading comprehension. Morphological awareness contributes to morphological decoding which can influence word reading and reading comprehension. Weak morphological awareness may be a limiting factor in the acquisition of new vocabulary. Morphological awareness can help learners find out the meaning of new and morphologically complex words while reading. According to Jiang, Kuo, and Sonnenburg-Winkler (2015), significant differences exist between successful and less successful readers in how they apply morphological information. Successful readers value derivational morphology while less successful readers underestimate it.

As stated above, previous studies confirm the positive relationship between awareness in derivational morphology and reading comprehension. Although the potential impact of morphological awareness on vocabulary and reading has been supported by research, studies conducted with learners for whom English is a second or foreign language are limited. Unfortunately, limited studies have been conducted on EFL learners and most existing studies are correlational studies, not considering the effect of morphological instruction. Intervention studies on L1 learners show that morphological instruction can help learners build vocabulary and improve their reading skills (Bowers, Kirby, & Deacon, 2010; Goodwin & Ahn, 2013). Morphological instruction can be an essential area of vocabulary instruction, vocabulary learning, and reading comprehension (Lo, Anderson, & Bunch-Crump, 2017). There is a need to evaluate instructional approaches that can develop learners’ morphological awareness with the ultimate goal of accelerating their independent word learning and reading comprehension.

### 1.2. Metalinguistic awareness

Metalinguistic awareness means thinking about one’s own language and reflecting on one’s language (Scott & Nagy, 2004). It is clearly accepted that metalinguistic awareness helps language learners in the learning process. One of the subcategories of metalinguistic awareness is morphological awareness (Yucel-Koc, 2015). Morphological awareness plays a major role in literacy acquisition because “English language is a morpho-phonemic language” (Carlisle, 2003, p. 292). This emphasizes the relationship between morphological awareness and literacy relationship.

With regard to reading and metalinguistic awareness, Nagy, Beminger, and Abbott (2006) stated that there is a strong relationship between metalinguistic awareness and reading comprehension. Metacognitive and metalinguistic factors play an important role in learners’ vocabulary growth and reading skills. Morphological awareness, as a subcategory of metalinguistic awareness, is related to vocabulary and reading comprehension. According to Tighe et al. (2018), metalinguistic skills such as morphological awareness have direct and indirect relationships with reading comprehension abilities of adult readers. Metalinguistic awareness is related to reading comprehension via decoding and oral vocabulary knowledge.

Numerous theories and hypotheses have been proposed by linguists to find out how a language is learnt. Noticing Hypothesis, as one of the second language acquisition theories, has importance to the current paper. Schmidt (2001) proposed that learning does not happen without noticing, and he claimed that it is a requirement for learning a language. Noticing hypothesis is connected to metalinguistic awareness. In second language acquisition research, metalinguistic awareness appears under different names such as noticing, consciousness, and consciousness raising (Yucel-Koc, 2015). Schmidt’s language awareness/noticing hypothesis refers to metalinguistic awareness. He states that second language acquisition is different from first language acquisition. According to him, incidental learning is possible in L1 acquisition, but not in L2 acquisition. Schmidt (1990) stated that intentional learning is necessary specifically for adult L2 learners. He stated that noticing is the first step to acquire language forms. This means metalinguistic awareness of language forms helps learners to acquire those forms and also helps with their retention.
According to Schmidt (1990), explicit teaching and increasing learners’ awareness play a significant role in language learning process and this is closely related to form-focused instruction. According to Ellis (2001), form-focused instruction is any planned or incidental instructional activity that aims to induce language learners to pay attention to linguistic form. Focus on form should not be overlooked in the learning process. Language instruction with a focus on creating metalinguistic awareness can cause better language gains (Fotos, 1994; Swain, 1998). Instruction with the aim of creating morphological awareness is planned instruction with the aim of helping learners pay attention to morphological forms.

1.3. Three aspects of derivational morphology
Awareness in derivational morphology consists of three components; relational, syntactic, and distributional aspects. Relational awareness is the ability to recognize the stem in morphologically complex words and understand the relationship between the stem and the suffix (Kuo & Anderson, 2006). It is based on the understanding that there is a semantic relationship between different morphological forms of a word (Kieffer, 2009). If a student can recognize that the stem of “productive” is “product” and understand that—ive was added to make a new word, he/she is said to have relational awareness. According to Tyler and Nagy (1989), awareness in relational morphology is the fundamental understanding that words have internal structure. Words that share a common base morpheme also share some aspects of meaning. Relational aspect of derivational morphology, according to Tyler and Nagy (1989), is the simplest and most early developing morphological aspect. It has been tapped in the classic “Comes From” task used in many studies (Carlisle, 1995; Mahony, Singson, & Mann, 2000; Nagy et al., 2006). In these tasks, the learners are asked to judge relationships across words, such as “Does farmer come from farm?”

Syntactic awareness is the understanding of how a derivational suffix changes the part of speech of a word and how derived words function in clauses or sentences. A student is said to have syntactic awareness, if he or she recognizes that although the words “productive” and “production” contain the same stem, the suffixes that have been added determine the part of speech and the way the two words function in a sentence. According to Tyler and Nagy (1989), insights into syntactic morphology are more sophisticated than insights into relational morphology. They require the recognition that derivational suffixes such as -ize or -ion demonstrate semantic relationships across words in specific ways, including marking words for particular syntactic categories and grammatical roles within sentences. Syntactic aspect of derivational morphology is usually tapped by sentence completion tasks requiring students to generate morphological changes in a word; for example the word “farm” to complete a sentence such as “My uncle is a———-” (Carlisle, 2000). The adaptations of these tasks have reduced the task demands by changing it to a multiple choice task in which the learners choose among various affixed options (Nagy et al., 2006; Singson, Mahony, & Mann, 2000).

Distributional awareness refers to the ability to understand how affixes are constrained and limited by the syntactic category of the stem (Kuo & Anderson, 2006). It reflects awareness of linguistic constraints on the allowable connections of stems and suffixes, influenced by the grammatical category of the base word. For example, the suffix—less can be attached to nouns such as “senseless”, but it cannot be attached to adjectives. Also—ness cannot be attached to verbs so the word “playness” is incorrect, but it can be attached to adjectives so the word “quietness” is correct. Thus the suffix -ness is constrained by the syntactic category of the stem. According to Tyler and Nagy (1989), when compared to syntactic aspect of derivational morphology, distributional aspect is even more sophisticated. As McCutchen, Green, and Abbott (2008) state, such distributional constraints have been studied explicitly in relatively few studies, always in conjunction with other morphological tasks.

A developmental sequence exists concerning three aspects of derivational morphology (Kieffer, 2009). Researchers have found that relational aspect develops before syntactic and distributional aspect (McCutchen et al., 2008; Tyler & Nagy, 1989). According to Loudermill (2014), it is highly unlikely that learners will acquire syntactic aspect before having a deep understanding of
relational aspect and the same is true for the acquisition of distributional aspect. Distributional aspect is the most complex aspect of derivational morphology and learners must have adequate knowledge of both relational and syntactical aspect before distributional aspect can be acquired.

2. Review of literature

2.1. Studies on three aspects of derivational morphology in relation to reading

Although numerous studies exist in literate concerning the relationship between morphological awareness and reading comprehension, the number of studies considering aspects of derivational morphology in relation to reading comprehension is limited. Katz (2004) conducted a study with the aim of determining if the three aspects of derivational morphology (relational, syntactic, and distributional aspects) emerge as underlying factors in morphological awareness. This study tried to determine the contribution of each aspect to reading comprehension. Participants included native speakers of English from fourth and sixth grade. The results showed significant correlation between morphological awareness and reading comprehension. The strongest correlation was observed between tasks of morphological awareness and passage comprehension.

McCutchen et al. (2008) used a reliable and broad-based measure of morphological awareness. It tapped relational, syntactic, and distributional aspects of derivational morphology to examine the development of morphological awareness among older elementary native speakers of English. The relationship between morphological awareness and a range of literacy measures such as reading was also studied. They found that morphological awareness continued to develop from fourth to sixth grade and the differences between fourth and sixth grade native speaking students were significant only for the more sophisticated morphological aspects (syntactic and distribution rather than relational). Unfortunately, the correlation between each aspect of derivational morphology and reading comprehension ability was not examined separately.

Loudermill (2014) investigated the relationship between reading comprehension and knowledge of derivational morphology among native speakers of English struggling in reading. The study examined the three aspects of derivational morphology by isolating each aspect and presenting three separate morphological tasks to assess knowledge of derivational morphology in good and poor comprehenders. The study tried to investigate if there is a statistically significant difference between knowledge of the three aspects of derivational morphology in good and poor comprehenders, and if there is a significant correlation between reading comprehension and knowledge of derivational morphology in poor comprehenders. Results showed significant difference in each of the three aspects of derivational morphology among the participants. The poor comprehenders in the current study performed better on tasks assessing relational knowledge than on tasks assessing syntactic knowledge. This suggested that their relational knowledge was more developed than their syntactic knowledge just as seen in the good comprehenders group.

The above are the limited studies existing in literature concerning the relationship between aspects of derivational morphology and reading comprehension. All of them are correlational and relational studies. None of them considers the effect of instruction on aspects of derivational morphology and its resulting effects on reading comprehension. The participants of the studies were native English speakers. Therefore, a gap exists in literature concerning EFL learners and how morphological instruction on aspects of derivational morphology can affect their reading comprehension.

2.2. Morphological instruction

As stated above, most studies concerning morphological awareness and reading are relational or correlational studies. With L1 learners, Levesque et al. (2017) studied English-speaking learners’ ability to read and analyze the meaning of morphologically complex words (morphological decoding and morphological analysis) and its relationship with reading comprehension. The results demonstrated that morphological awareness contributed to reading comprehension beyond all other variables. Furthermore, Levesque, Kieffer, and Deacon (2018) investigated how core skills...
surrounding morphemes support the development of reading comprehension among English-speaking students. The findings demonstrated that students' use of morphemes to infer the meanings of unfamiliar complex words supports the development of reading comprehension.

Instructional studies on English L1 learners investigating the effect of morphological instruction on different language skills exist in the literature. Baumann, Edwards, Boland, Olejnik, and Kame'enui (2003) and Baumann et al. (2002) investigated the effects of morphological instruction on vocabulary learning among native L1 learners. Both studies targeted relational aspect of derivational morphology by asking students to provide definitions of morphologically complex words that were scored based on students' recognition of the meanings of taught word parts. The results showed that students who received instruction in specific prefixes and suffixes were more successful in inferring the meaning of morphologically complex words compared to students who received direct instruction in textbook vocabulary. These two studies provide evidence for susceptibility of relational aspect to instruction but raise the question of susceptibility of other aspects of derivational morphology to instruction. Other interventional studies showing the positive effects of morphological instruction on literacy among L1 learners include Goodwin and Ahn (2013) and Bowers et al. (2010).

Different studies on L2 learners have investigated the relationship between morphological awareness and literacy. Zhang and Koda (2012) tested the direct and indirect effects of morphological awareness on L2 vocabulary knowledge and reading comprehension among advanced Chinese EFL readers. They found positive effects of morphological awareness on reading comprehension. In addition, Shoeib (2017) investigated levels of awareness of EFL Saudi university students and tried to discover any potential relationship between their morphological awareness and successful reading comprehension. The total scores of students on morphological tests positively correlated with their total scores on reading comprehension test. Jiang et al. (2015) examined the relationship between morphological awareness and reading comprehension among adult EFL learners. Findings showed significant differences between successful and less successful adult EFL readers concerning morphological knowledge. While successful readers valued derivational morphological rules, less successful readers underestimated the importance of morphological knowledge. Zhang (2016) studied the contribution of morphological awareness to ESL reading comprehension with young Chinese-speaking ESL learners. The results demonstrated that morphological awareness had a significant direct effect on reading comprehension over and above vocabulary knowledge and such effect became stronger over time. The study indicated an increasingly important role for morphology in ESL reading comprehension and highlighted the need for explicit teaching of morphology to facilitate ESL learners' reading development. Unfortunately, this was not an instructional study.

Limited instructional studies concerning morphological awareness exist among L2 learners and there is a great variety in the participants of these studies. Instructional studies are needed to investigate causal links between morphological awareness and literacy development. Little research has been carried out on morphological awareness related to EFL learners as the central focus (Hamavandi, Rezai, & Mazdayasna, 2017). Findings with L1 learners can hardly be generalized to L2 learners.

Diaz (2010) investigated if morphological instruction was effective in accelerating the acquisition of spelling, vocabulary, and reading comprehension by English language learners and their English dominant peers. The results showed that ELL students could make significant progress in reading, vocabulary, and spelling when morphological instruction was a major part of the curriculum. Crosson et al. (2018) investigated whether instruction concerning morphological awareness would enhance word learning outcomes of ELL adolescents. The results showed significant treatment effects for morphological problem-solving of unfamiliar words which led to lexical access.

The above studies show the positive effects of morphological awareness on literacy, especially reading comprehension. As we see instructional studies concerning morphological awareness on L2 learners are limited and there is a great variety in the participants. There is a gap in the
literature in terms of instructional studies conducted on EFL learners. Moreover, no study has investigated the effect of instruction on aspects of derivational morphology and how creating morphological awareness in learners concerning these three aspects can affect reading comprehension among EFL learners.

3. The present study
As discussed above, morphological awareness can have positive effects on language literacy. Derivational morphology is the most widely studied aspect of morphology. Creating awareness in derivational morphology through instruction is considered as one of the prerequisites to other skills such as vocabulary and reading. Unfortunately, limited studies have examined three aspects of derivational morphology independently (Katz, 2004; McCutchen et al., 2008). Even in the limited studies considering aspects of derivational morphology, the effects of instruction on these aspects and their effects on reading comprehension have not been considered, and no studies exist in EFL context regarding the matter. It is not known whether these aspects are susceptible to instruction in EFL context, whether receiving instruction in these aspects and increasing EFL learners’ awareness can help their reading comprehension, and awareness in which aspect will help learners reading comprehension to a higher degree. Furthermore, the way this type of instruction affects different proficiency levels needs to be investigated in EFL context.

To sum up, the present study aims to investigate the impact of morphological instruction on awareness in aspects of derivational morphology (relational, syntactic, and distributional aspect) among EFL learners at two different levels (lower intermediate, higher intermediate). The study also investigates how morphological instruction in aspects of derivational morphology can in turn affect EFL learners reading comprehension.

3.1. Research questions

Q1: Does morphological instruction improve EFL learner’s morphological awareness in three aspects of derivational morphology (relational, syntactic and distributional) in lower intermediate and higher intermediate levels of proficiency? Which aspect of derivational morphology is more susceptible to instruction among the two proficiency levels?

Q2: Does morphological instruction on three aspects of derivational morphology have an impact on the improvement of reading comprehension of lower and higher intermediate EFL learners? Do students in the experimental groups and control groups differ significantly on a standardized reading comprehension test after treatment?

Q3: Is there a significant correlation between reading comprehension and awareness in three aspects of derivational morphology in intermediate EFL learners after the treatment? Which aspect is most highly correlated with reading comprehension in the experimental groups after the treatment?

4. Methodology

4.1. Design
The study had a pretest-posttest quasi-experimental control group design. The purpose of the design was to find out how instruction could affect EFL learners’ awareness in three aspects of derivational morphology and how this awareness in turn could affect their reading comprehension. The experimental groups received morphological awareness instruction while the control groups continued their regular instruction without intervention.

The independent variables were morphological instruction or treatment (experimental group receiving morphological instruction and the control group receiving regular instruction), time (pretest, posttest), and level of proficiency (lower intermediate, higher intermediate).
Accordingly, the participants were divided into four subgroups: lower intermediate experimental (1), higher intermediate experimental (2), lower intermediate control (3), and higher intermediate control (4). The dependent variable was morphological awareness in three aspects of derivational morphology and reading comprehension.

4.2. Participants
The participants were 129 students chosen from the freshmen studying at Imam Javad university college, Yazd, Iran. The first language of all participants was Farsi. They were both male and female (70 male and 59 female), aged between 18 and 21 (M = 19 years and six months). During their first semester, students at this university have preparation courses such as English in order to make them ready for the main course being held in the following terms. Students going through the English courses were selected for the study. The students took part in the Oxford Placement Test, and based on the results and determination of their level, they were divided into lower intermediate (B1) and higher intermediate (B2) proficiency classes. Classes in each level were randomly assigned as experimental and control groups (Table 1). The participants of the study had willingly signed a consent form before participating in the study. Participants were informed that the data collected during the course will be used for research purposes.

4.3. Instruments
The base words used for the instruction and also for the morphological awareness tests were selected from Longman Communication 3000. It is a list of the 3000 most frequent words in both spoken and written English. It is based on statistical analysis of 390 million words contained in the Longman Corpus Network. The list represents the core of English language. The base words selected for this study were among the 3000 most frequent words in written English (Table A1). Since learning the base of the word was not the aim of this study, low frequency words were not selected. The focus of the study was creating awareness in the relationship of the base and the suffixes, how suffixes change part of speech of words, how base words function with a specific suffix, and how part of speech of the base can limit the suffixes. For this reason, selecting relatively high frequent base words reduced the burden of learning the base itself and allowed the learners to focus on the above mentioned aims as the main focus of the study. After base word selection, 30 of the most common suffixes of English, suitable for levels B1 and B2 were selected based on Carter, McCarthy, Mark, and O’keefe (2016). They included noun making suffixes: -ance/ence, -er/or, -sion/tion, -al, -dom, -ee, -hood, -ism, -ist, -ment, -ness, -ry, -ship, -ian; verb making suffixes: -ate, -en, -ify, -ize; adjective making suffixes: -able/ible, -al, -ful, -ic, -ish, -ive, -less, -ly, -ous, -y and adverb making suffix: -ly. These 30 suffixes were used during the instruction and also in designing the tests. In each session, three suffixes were taught and for each suffix, four base words were selected from Longman Communication 3000 to which the suffixes attached. From the four base words selected for each suffix, two of them were orthographically transparent and two of them were opaque after adding the suffix (Table A1). According to Loudermill (2014), if in a morphologically complex word the base word is spelled the same in derivative as is when spelled

| Gender                  | Subgroup        | Male   | Female | Age mean (Year: month) |
|-------------------------|-----------------|--------|--------|------------------------|
| Experimental            | Lower           | 1      | 23     | 23                     | 19:3       |
|                         | Intermediate    |        |        |                        |
|                         | Higher          | 2      | 19     | 15                     | 18:11      |
|                         | Intermediate    |        |        |                        |
| Control                 | Lower           | 3      | 13     | 10                     | 20:1       |
|                         | Intermediate    |        |        |                        |
|                         | Higher          | 4      | 15     | 11                     | 19:1       |
|                         | Intermediate    |        |        |                        |
in isolation (e.g., dark; darkness), that word is said to be orthographically transparent and if the spelling changes occur at the end of the word before adding suffix (e.g., happy; happiness), that word is said to be orthographically opaque. The aim of including both transparent and opaque words in this study was to expose the learners to different types of words they would face in real texts and comparison between them was not the aim. Including only transparent words would have missed nearly half the conditions learners are faced with in texts.

The measures of this study included a homogeneity test, morphological awareness tests related to the three aspects of derivational morphology, and reading comprehension test. All tests were administered as pretest and posttest to both experimental and the control groups. The Oxford Placement Test (2004) was used as a standard test of homogeneity in this study as a reliable and efficient means of placing students at the start of the course. The test has been calibrated against the level system provided by the common European framework of references for languages.

To assess the effectiveness of morphological instruction, measures of morphological awareness were used to assess students’ ability in different aspects of derivational morphology. The items in the morphological awareness tasks tapped relational, syntactic, and distributional aspects. Each test included 30 items which were half transparent and half opaque items concerning orthography. The words selected for the test were the same as the words the learners were exposed to during instruction. As mentioned above, in order to control for word frequency, all the base words were selected among the 3000 most frequent words in written English from the Longman Corpus Network.

4.3.1. Tests of derivational morphological awareness

4.3.1.1. Relational aspect. Relational aspect has been mostly assessed by researchers using the TMS (Test of Morphological Structure), designed and used by Carlisle (2000). In this test, the students are asked to state the base form to complete the sentence once the examiner had given the derived form of the word and a sample sentence (e.g., Production/The factory wants to——— the goods). However, this version of TMS was not used in this study since in order to complete this test, syntactic (grammatical) awareness was needed to find the base form of the word in the sentence according to the function of the word. The application of this version does not measure pure relational awareness. According to Kuo and Anderson (2006), if a student can recognize the suffix and root of a given word, he/she is said to have relational awareness. Thus, a different version of TMS was used in this study in which the learners were faced with a set of morphologically complex words and they were required to state the base form and the suffix. The test was similar to tests of relational awareness tapped in the classic “Comes From” tasks used by Carlisle (1995) and Mahony et al. (2000). In the current study, students were exposed to a set of morphologically complex words in isolation and were expected to recognize the base of each word and the suffix. There were 30 items on this test (half transparent and half opaque) adding to 30 points, each corresponding to the 30 suffixes taught during the instruction. All the items had been covered during the treatment. If a learner provides correct answers concerning the base and the suffix, he/she would receive one point but if either one is incorrect only half a point would be given to them.

Example: In each section write the base (what word it come from) and suffix of the word.

| Transparent example: Senseless | Correct answer: Sense + less |
| Opaque example: Variable      | Correct answer: Vary + able |

4.3.1.2. Syntactic aspect. Syntactic aspect is usually assessed using the DST (Derivational Suffix Test). This test was originally developed by Mahony (1994) but adopted by Singson et al. (2000) and Nagy et al. (2006). Awareness in syntactic aspect of derivational morphology involves the understanding of how a derivational suffix changes the part of speech of a word and how derived
words function in clauses or sentences. The learner has to recognize the part of speech of the correct answer based on the suffix and also recognize the function of that word in the sentence. This test uses words in a sentence completion task to assess syntactic awareness by making grammaticality judgments. The test had 30 items adding to 30 points, each correct answer corresponding with one of the suffixes taught during the instruction. All correct answers had been taught during the treatment and all the distracters had been taught during the review sessions through cumulative word form charts (Table A2). Half of the correct answers were orthographically transparent and half of them were orthographically opaque.

4.3.1.3. Example (opaque). Those two dogs are almost———.
   A. identical  B. identify  C. identification  D. identity

   In the above test the learner needs to recognize that an adjective should fill in the gap and that among these alternatives the word “identical” is an adjective based on its suffix. The same holds for the following sentence in which a noun should fill in the gap.

4.3.1.4. Example (transparent). The patient's———against the disease has decreased.
   A. resistless  B. resist  C. resistance  D. resistible

4.3.1.5. Distributional aspect. Distributional aspect is usually assessed using a judgment task used in Tyler and Nagy's (1989) study of derivational morphology. The learners have to judge whether the word given is correct or not based on the suffix added to the base. In this format of distributional tests, the testee has a 50% chance of getting the correct answer. To this reason, the objective format was used in the current study to reduce lucky guesses. There were 30 items on the test adding to 30 points, each containing three correct words to which the learners had been exposed to during instruction and one incorrect word which was made by adding a suffix to an unsuitable base word due to its part of speech.

   Example: In each set determine which word does not exist in English.
   a. childable  b. equality  c. characterize  d. measureless

   In the above test “childable” is an incorrect word since—able cannot attach to nouns.

   Once the tests were adopted and made ready, a Ph.D. in linguistics and a Ph.D. candidate in TEFL reviewed the tests and some parts were revised. Then the tests were piloted with a group of students similar to the target group before using in the actual study. The reliability of the tests was calculated by SPSS separately in this phase and the results showed that all three tests enjoyed a high degree of consistency (Cronbach’s α: .855, .876 and .765 for the three tests, respectively).

4.3.2. Reading comprehension test
The standard Nelson–Denny Reading Test (ND) was used to measure learners reading comprehension ability. This standard test was selected because it is suitable for group administration and it includes norms for college students. The ND is a well-regarded instrument used both for research purposes and reading progress assessment in colleges and in clinical settings (Masterson & Hayes, 2004). Parallel forms G and H were used in this study for pretests and posttests. Only the reading comprehension section was used in this study. It includes 38 questions and for each correct answer, learners gain one point.

4.4. Procedure
After going through the Oxford Placement Test, the participants of the study in each proficiency level were randomly divided into experimental and control groups. The students in the
experimental groups received explicit instruction in aspects of derivational morphology. All the participants took the tests on three aspects of derivational morphology and reading comprehension as pre and posttests. One of the researchers taught all four classes. Both experimental and control groups met with the researcher as the teacher of both classes once a week for 90 min. The study took 16 weeks, but the instruction period was 12 weeks (10 instructional sessions plus 2 review sessions) and pre and posttests were administered in the first and last two weeks of the course (week 1: pretests of derivational morphology, week 2: pretest of reading comprehension, week 15: posttests of derivational morphology, week 16: posttest of reading comprehension).

4.4.1. Treatment
The students in the experimental groups received 12 weeks of instruction and review on morphological structure of words focusing on the three aspects of derivational morphology. Three suffixes were selected for each session with four orthographically transparent and opaque base words for each suffix (Table A1). The words were presented both in isolation and in texts. The texts were selected from level appropriate text books such as “Select Readings”, intermediate level, by Lee and Gundersen (2011). Three aspects of derivational morphology were taught in details and the order of presenting different aspects of derivational morphology was considered, starting with relational and ending in distributional aspect. The students received explicit and direct instruction in morphological analysis strategies. The steps included the following:

- Presenting the base and its meaning (e.g., resist); the definition of the base was explicitly taught in print and also explained by the teacher by presenting the students friendly definitions and giving examples of contexts to which the word applied;
- Introducing the suffix (e.g., -ance);
- Adding the suffix to the base word (e.g., resist + ance = resistance);
- Explaining changes in spelling in case of opaque words;
- Giving the meaning of each word considering the combination of the base and the suffix;
- Explaining the part of speech of each word based on the suffix (e.g., words ending in ance/ence are nouns);
- Providing level appropriate sentences containing the words and explaining the function of that word in the sentence based on its part of speech (e.g., “Their resistance against the enemy’s attacks led to success”; explaining that nouns or noun phrases are used after possessive pronouns);
- Elaborating on the allowed parts of speech to which the suffix can be added (e.g., -ance/-ence can only be added to verbs).

Follow up activities included tasks such as matching a definition with the correct derived word, matching the words with the appropriate suffixes (product + ive), breaking the words up (depend-able—depend-able), categorizing words according to their parts of speech, using derived words in sentence gaps, and choosing among foil and correct words based on the suffix. Corrective feedback was given throughout the lessons. The last two sessions of the treatment were devoted to reviewing the base words and suffixes in cumulative word form charts (Table A1). Thus if the base word “resist” had been taught during the treatment and accompanied the suffix—ance to make the word “resistance”, the learners were exposed to other derived examples from the base words (e.g., resistless & resistivity) during the review sessions.

While experimental groups were receiving the treatment, control groups went through 12 weeks of instruction, being exposed to the same words included in the same texts as the experimental groups, but receiving instruction on those words only regarding their meaning. All the words were presented and defined for the learners without any focus on morphological aspects of those words. The students in the control groups also had follow up activities which focused on word meaning and functions of those words in sentences without emphasizing morphological aspects.
At the end of the 12-week instruction, the participants took the posttests in the same way they took the pretests. Concerning researcher adapted assessments, forms with the same test items reordered were used to minimize their surface similarity and for the standard reading test, a different form of the test was used. There was a three months gap between pre- and posttests. The tests in multiple choice formats were graded by the researcher and the relational test which was not in multiple format, was also graded by another rater. The inter-rater reliability was calculated (Cronbach’s $\alpha = .92$).

Thirty percent of the sessions were randomly selected to assess the treatment fidelity of the program. The trained research assistant completed a checklist for each session viewed and confirmed that the principle components were present for each type of treatment and the procedures outlined in the lesson.

4.5. Data analysis
The results of the study were analyzed using SPSS software. For the first research question, a mixed-design ANOVA (with scores on the three aspects of derivational morphology as the dependant variable) with two factors (treatment and proficiency level) and a repeated measure (time) was conducted in order to investigate to what extent morphological instruction can improve EFL learners’ morphological awareness in three aspects of derivational morphology for each proficiency level. In order to compare the improvements of the four subgroups in each aspect, their gain scores in each aspect were computed and a two-way between groups analysis of variance (two-way ANOVA) was conducted. As follow up analysis, pairwise multiple comparisons using independent $t$-tests between the four subgroups were applied. For the second research question, a mixed-design ANOVA was conducted to analyze the reading comprehension scores and to investigate the effect of morphological instruction on the reading comprehension of intermediate EFL learners. In order to compare the improvements of the four subgroups in reading comprehension, their gain scores in reading comprehension were computed and a two-way between groups analysis of variance (two-way ANOVA) was conducted. For the third research question, Pearson correlation test was conducted in order to find out if a relation existed between reading comprehension and three aspects of derivational morphology in the experimental groups after receiving the treatment.

5. Results

5.1. The effects of morphological instruction on awareness in aspects of derivational morphology
The mean scores and standard deviations for three aspects of derivational morphology at two different times (pretest/posttest), two treatments (experimental/control), and two proficiency levels (lower intermediate/higher intermediate) are displayed in Tables 2–4.

Independent sample $t$-test of pretest scores for each aspect (Table 5) demonstrated that before starting the treatment, there was no significant difference between the pretest scores of experimental and control groups in each level ($p > .05$).

A mixed-design ANOVA (with the score on the three aspects of derivational morphology as the dependant variable) with two factors (treatment and proficiency level) and a repeated measure (time) was conducted. The preliminary analyses showed no violation of homogeneity of variance ($p > .05$) and equality of covariance matrices ($p > .05$). In addition, the normality test of residuals was not rejected ($p > .05$). The results showed that significance values for all main and interaction effects were less than .05. Concerning time, the value for Wilks’ Lambda was 0.179, $F(3,123) = 1.8$ with a probability value of $p = .000$ showing a statistically significant effect of the within subject variable. The partial eta-squared value was .821 indicating a large effect size. Besides, both between subject variables of treatment [$F(3,123) = 24.1$, Wilks’ Lambda = 0.63, $p = .000$, eta-squared = .37] and proficiency [$F(3,123) = 90.7$, Wilks’ Lambda = 0.31, $p = .000$, eta-squared = .68] were significant. The interaction effects of Time *
| Time                        | Treatment | Proficiency  | Mean  | SD   | Min | Max | N  |
|-----------------------------|-----------|--------------|-------|------|-----|-----|----|
| Posttest relational aspect  | Experimental | Lower intermediate | 25.50 | 3.38 | 14  | 30  | 46 |
|                             |           | Higher intermediate | 26.79 | 3.22 | 19  | 30  | 34 |
|                             | Control   | Lower intermediate | 12.30 | 3.87 | 6   | 20  | 23 |
|                             |           | Higher intermediate | 20.96 | 4.79 | 11  | 28  | 26 |
| Pretest relational aspect   | Experimental | Lower intermediate | 12.36 | 4.86 | 2   | 24  | 46 |
|                             |           | Higher intermediate | 19.02 | 5.14 | 7   | 28  | 34 |
|                             | Control   | Lower intermediate | 10.52 | 4.51 | 1   | 19  | 23 |
|                             |           | Higher intermediate | 17.80 | 4.67 | 8   | 25  | 26 |
| Time                        | Proficiency         | Treatment | Lower intermediate | Mean | SD   | Min | Max | N  |
|---------------------------|---------------------|-----------|--------------------|------|------|-----|-----|-----|
| Posttest syntactic aspect | Experimental        | Control   | 21.30              | 25.44| 4.31 | 6   | 28  | 46  |
|                           | Control             |           | 5.84               | 10.91| 3.91 | 1   | 18  | 46  |
|                           | Higher intermediate |           | 21.88              | 25.44| 4.48 | 6   | 28  | 34  |
|                           | Higher intermediate |           | 18.88              | 25.44| 4.48 | 6   | 28  | 34  |

| Pretest syntactic aspect  | Experimental        | Control   | 0                  | 5.94 | 3.91 | 0   | 15  | 46  |
|                           | Control             |           | 4.80               | 18.34| 4.38 | 12  | 28  | 26  |
|                           | Higher intermediate |           | 18.34              | 18.34| 4.38 | 12  | 28  | 26  |
| Time                  | Proficiency       | Mean  | SD   | Min | Max | N  |
|----------------------|-------------------|-------|------|-----|-----|----|
| Posttest distributional aspect | Experimental | 12.21 | 7.16 | 0   | 24  | 46 |
|                      | Higher intermediate | 20.17 | 5.19 | 8   | 29  | 34 |
|                      | Lower intermediate | 6.91  | 4.64 | 0   | 15  | 23 |
|                      | Higher intermediate | 4.35  | 3.69 | 0   | 14  | 26 |
| Pretest distributional aspect | Experimental | 10.20 | 3.78 | 2   | 24  | 34 |
|                      | Higher intermediate | 5.12  | 2.82 | 1   | 11  | 23 |
|                      | Lower intermediate | 4.67  | 4.06 | 4   | 20  | 26 |

Table 4: Descriptive statistics (distributional aspect)

Amirjalili & Jabbari, Cogent Education (2018), 5: 1523975
https://doi.org/10.1080/2331186X.2018.1523975
Treatment \((F(3,123) = 42.6, \text{Wilks' Lambda} = 0.49, p = .000)\), Time * Proficiency \((F(3,123) = 26.06, \text{Wilks' Lambda} = 0.611, p = .000)\) and Time * Treatment * Proficiency \((F(3,123) = 15.79, \text{Wilks' Lambda} = 0.722, p = .000)\) were also significant. Therefore follow up analysis was conducted.

Independent sample \(t\)-tests of posttest scores indicated a statistically significant difference between the experimental and control groups in aspects scores in both proficiency levels, as demonstrated in Table 6.

The above results demonstrate that the experimental groups outperformed the control groups after the treatment. In order to compare the improvements of the four subgroups in each aspect, their gain score from pretest to posttest in each aspect was computed for each participant by subtracting each person’s pretest score from his or her posttest score in each aspect. A two-way between groups analysis of variance was conducted in order to compare the improvement of each subgroup in each aspect. Preliminary analyses showed no violation of assumptions of normality and homogeneity of variance (Levene’s test, \(p > .05\)). The effect of Treatment, Proficiency and Treatment*Proficiency was significant for relational and syntactic aspect but for the distributional aspect, only the effect of treatment was significant (see Table 7).

Pairwise multiple comparisons using individual independent \(t\)-tests between the four subgroups are demonstrated in Table 8.

For the relational aspect, the results in the above table indicate that the mean improvements (gain) in relational aspect for subgroup 1 \((M = 13.13)\) were significantly greater than subgroup 2.
The improvements of subgroups 3 ($M = 1.78$) and 4 ($M = 3.15$) were not significantly different and their improvements were significantly lower than subgroups 2 and 1.

The difference between gain scores in the experimental groups in relational aspect was greater compared to control groups as demonstrated in Figure 1. In the experimental groups, the lower intermediate proficiency had greater improvements compared to higher intermediate proficiency. The gain scores were similar in the control groups.

Concerning syntactic aspect, improvement (gain) in subgroup 1 ($M = 15.45$) was significantly greater than the other subgroups. The improvement of subgroup 2 ($M = 6.56$) was significantly greater than subgroup 4 ($M = 3.53$). As shown in Figure 2, the experimental groups had better
improvement in syntactic aspect compared to the control groups. In the experimental groups, the lower intermediate proficiency had higher improvement compared to higher intermediate proficiency. The gain scores were similar in the control groups.

Concerning distributional aspect, the results indicated that improvements (gain) due to treatment for subgroups 1 and 2 did not differ significantly ($M = 7.54$, $M = 9.97$, respectively). Moreover, there was no significant difference between the improvements of distributional aspect for subgroups 3 and 4 ($M = 3.13$, $M = 1.61$, respectively), and their improvements were significantly lower than subgroups 1 and 2. As shown in Figure 3 the experimental groups had better improvements in distributional aspect compared to the control groups. The gain scores of both proficiency levels were similar in each group.

In order to see which aspect of derivational morphology is more susceptible to instruction, the mean improvements (gain) from pretest to posttest in each aspect by participants in the experimental groups were compared. The results concerning pairwise comparison of improvements using paired sample t-test between aspects in the experimental groups showed that for the lower intermediate proficiency, improvement in syntactic aspect ($M = 15.45$) was significantly greater than relational ($M = 13.13$) and relational was significantly greater than distributional ($M = 7.54$). For the higher intermediate proficiency, the results show that improvements in distributional aspect ($M = 9.97$) was significantly greater than relational ($M = 7.76$) and syntactic aspect ($M = 6.56$). There was no significant difference between improvements in relational and syntactic aspects (see Table 9).

5.2. The effects of morphological instruction on reading comprehension

The mean scores and standard deviations for the reading test at pretest and posttest are displayed in Table 10.

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**Table 9. Multiple individual paired t-test between all pairs of aspects gain scores in experimental groups**

| Lower intermediate | t-value (df) | Sig. |
|--------------------|--------------|------|
| Syntactic          |              |      |
| Relational         | 2.602(45)    | .012 |
| Distributional     | 7.89(45)     | .001 |
| Distributional     | 5.28(45)     | .000 |
| Higher intermediate|              |      |
| Syntactic          | 1.54 (33)    | .132 |
| Distributional     | 3.14(33)     | .003 |
| Distributional     | 2.12(33)     | .041 |

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Figure 3. Change over time in each subgroup (distributional aspect).
| Time          | Treatment     | Proficiency     | Mean  | SD   | Min | Max | N  |
|---------------|---------------|-----------------|-------|------|-----|-----|----|
| Pretest       | Reading comprehension | Experimental | Lower intermediate | 3.32 | 4.20 | 0   | 17  | 46 |
|               |               | Higher intermediate | 15.55 | 8.14 | 3   | 34  | 34 |
|               | Control       | Lower intermediate | 2.08  | 2.21 | 0   | 6   | 23 |
|               |               | Higher intermediate | 14.53 | 8.60 | 0   | 34  | 26 |
| Posttest      | Reading comprehension | Experimental | Lower intermediate | 13.89 | 8.58 | 0   | 35  | 46 |
|               |               | Higher intermediate | 30.67 | 6.24 | 15  | 38  | 34 |
|               | Control       | Lower intermediate | 6.30  | 5.29 | 0   | 17  | 23 |
|               |               | Higher intermediate | 18.07 | 8.45 | 6   | 37  | 26 |
Independent sample t-test of pretest scores for reading demonstrated that before starting the treatment, there was no significant difference between the pretest scores of experimental and control groups in higher intermediate \( t(58) = .046, p = .64 \) and lower intermediate \( t(67) = 1.32, p = .19 \) levels. A mixed-design ANOVA was conducted to analyze the reading comprehension scores. The preliminary analyses showed no violation of homogeneity of variance \( (p > .05) \) and equality of covariance matrices \( (p = .00) \). Besides, the normality test of residual scores was not rejected \( (p > .05) \). The results demonstrated a statistically significant effect for the within subject variable of time \( F(1,125) = 176.4, \text{Wilks' Lambda} = .41, p = .000 \). The partial eta-squared value was .585 indicating a moderate effect size. The between subject effects of proficiency \( F(1,125) = 148.3, p = .000, \text{eta-squared} = .543 \) and treatment were also significant \( F(1,125) = 26.3, p = .000, \text{eta-squared} = .174 \) but their interaction was not significant \( F(1,125) = 1.2, p = .275 \). The interaction effect of Time * Proficiency was not significant \( F(1,125) = 2.36, \text{Wilks' Lambda} = .981, p = .126 \) but the interaction effects of Time * Treatment \( F(1,125) = 50.7, \text{Wilks' Lambda} = .711, p = .000 \text{ eta-squared} = .29 \) and Time * Treatment * Proficiency \( F(1,125) = 4.31, \text{Wilks' Lambda} = .967, p = .04 \text{ eta-squared} = .033 \) were significant. Therefore, follow up analysis was conducted.

Independent sample t-tests of posttest scores indicated a statistically significant difference between the experimental and control groups in reading scores in higher intermediate \( t(58) = 6.64, p = .000 \) and lower intermediate \( t(67) = 3.87, p = .000 \) proficiency levels. Hence, experimental groups outperformed the control groups after the treatment. In order to compare the improvements of the four subgroups in reading comprehension, their gain scores from pretest to posttest in reading comprehension were computed for each participant by subtracting each person’s pretest score from his or her posttest score. A two-way between groups analysis of variance (two-way ANOVA) was conducted in order to compare the improvement in each level of treatment and proficiency in reading comprehension. Preliminary analyses showed no violation of assumptions of normality and homogeneity of variance \( (\text{Levene's test}, p > .05) \). The results indicated that the main effect of treatment was significant \( F(1,125) = 50.7, p = .0001 \), the main effect of proficiency was not significant \( F(1,125) = 2.36, p = .126 \), and the interaction effect of Treatment*Proficiency was significant \( F(1,125) = 4.31, p = .04 \). Pairwise multiple comparisons between the four subgroups are demonstrated in Table 11.

As demonstrated in the above table, the results indicated that the improvements in reading scores for subgroup 2 \( (M = 15.11) \) were significantly greater than subgroup 1 \( (M = 10.56) \) and subgroup 1 significantly greater than subgroups 3 and 4. There was no significant difference between subgroups 3 \( (M = 4.21) \) and 4 \( (M = 3.53) \). The gain scores in the experimental groups were greater compared to control groups as demonstrated in Figure 4. In the experimental groups, the higher intermediate proficiency had greater improvements compared to lower intermediate proficiency. There was no significant difference between the gain scores of the control groups.

### Table 11. Multiple individual t-test of gain scores in reading comprehension (subgroups 1–4)

| Subgroup | 1 | 2 | 3 | 4 |
|----------|---|---|---|---|
| t(df)    | 2.4(78) | 3.24(67) | 4.02(70) | 6.11(55) |
| Sig.     | .018 | .000 | .000 | .000 |

5.2.1. Relationship between aspects of derivational morphology and reading comprehension

Pearson correlation test was conducted in order to find out if a relation existed between reading comprehension and three aspects of derivational morphology in the experimental groups after
receiving the treatment. Preliminary analyses indicated that each pairs of variables were bivariate normal. The results demonstrated that reading comprehension posttest scores were highly correlated with distributional aspect ($r = .64, p = .000$) and were moderately correlated with syntactic and relational aspect, respectively ($r = .43, p = .000$ and $r = .32, p = .003$). This shows increase in awareness of aspects of derivational morphology can lead to an increase in reading comprehension ability especially distributional aspect.

6. Discussion

The current study attempted to investigate the impact of morphological instruction on three aspects of derivational morphology and in turn its effects on reading comprehension. The 12-week teacher implemented intervention had positive effects on morphological awareness and reading comprehension when compared to the regular instruction.

Concerning the first research question, addressing how morphological instruction improves learner’s morphological awareness in three aspects of derivational morphology, the results showed that the experimental groups significantly outperformed the control groups on all three tasks assessing derivational morphology and the positive effects of morphological instruction on these three aspects were confirmed. The results demonstrate that EFL learners can achieve positive results when exposed to rule-based procedures for understanding the English language system. When students were explicitly taught the morphological rules of English words, their awareness increased.

When considering the relational and syntactic aspects of derivational morphology, the students in the lower intermediate proficiency, with lower morphological awareness at pretest, benefited to a higher degree from the treatment in relational and syntactic aspects compared to the higher intermediate level. The learners at the lower level were more responsive to this particular treatment due to their lower initial levels of knowledge. The morphology lessons targeted relatively common suffixes and as expected had greater effects on the learners with the most limited levels of morphological awareness. The students in the higher level had already mastered some aspects of derivational morphology (Loudermill, 2014; McCutchen et al., 2008). This suggests that the treatment may be more appropriate for students with less developed language proficiency. Kieffer (2009) had found similar results with language minority learners. Having less awareness of derivational morphology regarding these two aspects on the footing helped them benefit from this instruction to a higher degree when compared to the higher intermediate proficiency level.

When looking at the improvements in distributional aspect, we see both experimental groups outperformed the control groups and there was no significant difference between the two experimental groups. The different results for the higher intermediate experimental group (subgroup 2)
concerning distributional aspect compared to the other two aspects could be due to the difficulty of distributional aspect compared to the other two. Therefore, the instruction benefited the higher level as well as the lower level. The higher intermediate learners were in a better learning situation to receive instruction on distributional aspect of derivational morphology when compared to relational and syntactic aspects due to their higher level of proficiency in language and the difficulty level of distributional aspect. Distributional aspect is the most complex aspect of derivational morphology and studies with native speakers have also confirmed that distributional aspect of derivational morphology is more difficult for learners to acquire compared to relational and syntactic aspects (Katz, 2004; McCutchen et al., 2008; Tyler & Nagy, 1989). In general, morphological instruction was more effective for less able learners concerning awareness in aspects of derivational morphology. Evidence that morphological instruction benefits lower level students concerning aspects of derivational morphology could have important practical implications. With morphological awareness gained with the support of instruction from the start, it is possible that many students who fail in typical instruction could be more successful (Bowers et al., 2010).

In sum, the improvements of the treatment groups were significantly better than those of the control groups in all aspects. Moreover, the improvements of the lower intermediate proficiency were significantly greater than higher intermediates in relational and syntactic aspects due to the instruction. The results also demonstrate that all aspects of derivational morphology were susceptible to instruction but for the lower intermediates, syntactic aspect and for the higher intermediate learners, distributional aspect was significantly more susceptible to instruction. The latter can be attributed to the difficulty of this task and the instruction being more beneficial for the higher proficiency. Susceptibility of relational aspect to instruction had been demonstrated in previous research with native learners (Baumann et al., 2003).

For the second research question, general results show that experimental groups in each level significantly outperformed the control groups in reading comprehension showing that receiving explicit instruction in derivational morphology had positive effects on reading comprehension abilities. Before receiving the treatment, there was no significant difference between the experimental and control groups in each level and the higher intermediate level had higher scores compared to lower intermediate as expected.

The results suggest that EFL learners need explicit instruction in how to use morphemes to find word meanings. In line with these findings, Zhang (2016) emphasizes the increasingly important role of morphology in L2 reading comprehension and highlights the need for explicit teaching of morphology to facilitate L2 learners’ reading development. EFL learners have limited exposure to the syntactic role of words compared to L1 readers due to differences in the amount of readings and this inhibits them to derive word meanings. Thus, they require explicit instruction in morphemes and their syntactic properties. In this study, students received instruction in both the meaning of morphemes and how to use this information to find the meaning of words and this in turn helped their reading comprehension. Morphological instruction had an impact on overall comprehension. The instruction supported the learners in having a strategy for finding the meaning of unknown words while reading a particular text, clarifying what they were reading and improving comprehension. According to Jiang et al. (2015), significant differences exist between successful and less successful adult EFL readers concerning morphological knowledge. Anglin (1993) states that as students face morphologically complex words, they need a strategy for determining the meaning of words they may have never encountered before and this is necessary for comprehension (Nagy & Townsend, 2012). Morphological awareness contributes to morphological decoding which can influence word reading and reading comprehension of learners (Levesque et al., 2017).

According to Perfetti (2007), lexical quality is important for reading comprehension (supra-lexical performance) since morphological instruction increases lexical quality. Stronger mental representations can improve reading comprehension by increasing efficiency of word identification and reducing the cognitive load needed for processing and integrating connected text. Also this type of
instruction provides the reader with easier access to semantic information associated with words. Levesque et al. (2018) state that students’ use of morphemes to infer the meanings of unfamiliar complex words supports the development of reading comprehension. Carlisle (2003) states that morphological awareness is important in terms of decoding the words and inferring their meaning. This awareness and building academic vocabulary can influence reading comprehension skills to a great extent. Students can play with words through deriving and decomposing words. Morphological awareness is considered as a language learning strategy. The positive effects of morphological instruction and awareness on reading comprehension raised in this study are in line with previous studies conducted with L1 and L2 learners of English. With L1 learners, Tighe et al. (2018) found positive relationship between morphological awareness and reading comprehension abilities of adult readers. With L2 learners Zhang and Koda (2012), found positive effects of morphological awareness on reading comprehension. Similar results were also found by Shoeib (2017) among EFL learners.

An important point observed in this study is that the treatment benefited the higher level to a greater degree when compared to the lower intermediate level concerning reading comprehension. However, when improvements in aspects of derivational morphology were compared, the lower level was in a better condition. Hence, the treatment was more effective for the lower level at sub-lexical level, but for the higher level, it was more beneficial at supra-lexical level. It appears that participants in the higher experimental group generalized their newly acquired skills to untaught words and their performance exceeded those of the lower group. The texts applied in this study, similar to all standard reading texts, included morphologically complex words and a number of roots had not been taught in class. It seems that the participants in the higher experimental group were more successful in generalizing their morphological information to new words following the treatment.

Research conducted on natives has also shown that morphological awareness plays a stronger role in reading development at higher levels, beginning around fourth grade, with stronger roles for fifth than fourth grade students (Deacon & Kirby, 2004). With English language learners, Diaz (2010) found smaller gains in reading for the lower group compared to the higher group after receiving morphological instruction. As he states, this is expected due to the global nature of reading. According to Logan (2010), morphological awareness becomes more important for reading comprehension in the upper grades.

In line with the third research question, the results demonstrated that reading comprehension was correlated with aspects of derivational morphology especially distributional aspect. Increasing the students’ awareness in derivational morphology helped them increase their scores in reading comprehension. Loudermill (2014) also found a significant correlation between reading comprehension and knowledge of aspects of derivational morphology among learners. Reading comprehension was correlated with distributional aspect to a higher degree compared to other aspects. This could be related to the fact that for the higher intermediate experimental group, distributional aspect was more susceptible to instruction and they had better improvements in reading compared to the other subgroups.

Overall, the current research adds to the body of literature that has examined the various aspects of derivational morphology and the developmental process related to their acquisition. The positive effects of morphological instruction with the aim of creating linguistic awareness were observed in the current study. Noticing the aspects of language following explicit instruction demonstrated positive effects for EFL learners. Noticing as metalinguistic awareness is the first step to acquire the language forms and it helps transfer those forms from short-term to long-term memory. This study proposes that noticing and awareness, as Schmidt (2001) stated, are necessary for learning. A high percent of words in the English language are derived (Nation, 2001). Noticing is argued as a necessary step prior to language acquisition (Schmidt, 2001). Suffixation and prefixation exist in most words in English and noticing those suffixes or prefixes can play a
crucial role in forming and reforming the words. Rather than memorizing the semantics of a word, the learners can meaningfully derive and decompose words and this can lead to meaningful learning instead of rote memorization.

The positive effects of explicit instruction observed in this study are also in line with the emphasis given to form focused instruction. The better performance of learners in the experimental groups demonstrates the benefits EFL learners obtain from focus on form instruction rather than focus on meaning. EFL learners can increase their metalinguistic awareness by thinking about the language and making reflections on it.

7. Conclusion

The impact of morphological instruction on three aspects of derivational morphology and its effect on reading comprehension was investigated in this study among intermediate EFL learners. The results were promising and demonstrated the positive effects of morphological instruction on awareness in three aspects of derivational morphology. EFL learners can increase their morphological awareness through instruction and the findings provide strong reasons to be optimistic about the susceptibility of morphological awareness to instruction. The learners who received morphological instruction were better in analyzing derived words than the control groups.

The results also demonstrated that receiving explicit instruction in derivational morphology has positive effects on reading comprehension abilities. EFL learners can make significant progress in reading when morphological instruction is a major part of the language curriculum. The study provides evidence of the relationship between reading comprehension and awareness of derivational morphology. According to this study, reading comprehension is correlated with aspects of derivational morphology, especially distributional aspect. The findings of this study are important since they show the role morphological awareness can play in EFL learning. It also shows that explicit morphological instruction contributes to second language learning.

The treatment benefited the higher intermediate level to a greater degree when compared to the lower intermediate level concerning reading comprehension. However, when improvements in aspects of derivational morphology were compared, the lower level was in better condition. It is concluded that the treatment is more effective for lower levels at sub-lexical level but for higher levels, it is more beneficial at supra-lexical level.

The findings have implications for instructional practices and intervention research in adult EFL programs and can find their way into educational practice. Teachers may recognize the value of instruction in aspects of derivational morphology and how it affects literacy, especially reading comprehension of the learners. Such understanding could help educators determine whether morphemic structure deserves a place in EFL instructional courses and if so, at what grade levels. The instruction can help the learners as they become more aware of how to derive the meanings of morphologically complex words. The findings can benefit EFL instructors to focus on the merits of morphological instruction by isolating each aspect and increasing learners’ awareness which can in turn lead to morphological awareness skills at sub-lexical levels and higher literacy at supra-lexical levels. The sequence of presenting materials in aspects of derivational morphology and offering instruction on theses aspects should be observed by material developers and EFL instructors.

8. Limitations and further research

As there seems to be no studies available on the effects of morphological instruction on aspects of derivational morphology among EFL learners, further research can be conducted to figure out the subsequent effect of this instruction on other forms of literacy such as listening, speaking, and writing. Furthermore, this study was conducted with adult EFL students in the lower and higher intermediate level; therefore, the results may not be generalizable to other ages and levels of proficiency. It would be interesting to see how EFL learners in other levels of proficiency would behave when receiving such treatment. Future research needs to include participants from a
broader range of age levels. In addition, further research can investigate whether and how these improvements can be accelerated. It would be interesting to study the effects of this instruction on EFL learners who have a different L1 background. Additionally, future research studies may vary the duration and intensity of treatment to examine the different effects of these individual variables.

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References
Adams, M. J. (1990). Beginning to read: Thinking and learning about print. Cambridge, MA: MIT Press.
Allan, D. (2004). Oxford placement test: Test pack. Oxford: OUP.
Anglin, J. M. (1993). Vocabulary development: A morphological analysis. Monographs of the Society for Research in Child Development, 58(1), 1–166.
August, D., & Shanahan, T. (Eds.). (2006). Developing literacy in second-language learners: Report of the national literacy panel on language-minority children and youth. Mahwah, New Jersey: Lawrence Erlbaum Associates.
Baumann, J. F., Edwards, E. C., Boland, E. M., Olejnik, S., & Kame'enui, E. J. (2003). Vocabulary tricks: Effects of instruction in morphology and context on fifth-grade students’ ability to derive and infer word meanings. American Educational Research Journal, 40, 447–494. doi:10.1177/0001836703253613
Baumann, J. F., Edwards, E. C., Font, G., Tereshinski, C. A., Kame’enui, E. J., & Olejnik, S. (2002). Teaching morphemic and contextual analysis to fifth-grade students. Reading Research Quarterly, 37, 150–176. doi:10.1598/RRQ.37.2.3
Bowers, P. N., Kirby, J. R., & Deacon, S. H. (2010). The effects of morphological instruction on literacy skills: A systematic review of the literature. Review of Educational Research, 80(2), 144–179. doi:10.3102/0034654309359353
Brimo, D. (2016). Evaluating the effectiveness of a morphological awareness pilot study: The contribution of a morphological awareness intervention to reading achievement. Communication Disorders Quarterly, 38(1), 35–45. doi:10.1177/1525740115604592
Carlisle, J. F. (1995). Morphological awareness and early reading achievement. In L. Feldman (Ed.), Morphological aspects of language processing (pp. 131-154). Hillsdale, NJ: Lawrence Erlbaum.
Carlisle, J. F. (2000). Awareness of the structure and meaning of morphologically complex words: Impact on reading. Reading and Writing: An Interdisciplinary Journal, 12, 169–190. doi:10.1023/A:1008131926604
Carlisle, J. F. (2003). Morphology matters in learning to read: A commentary. Reading Psychology, 24, 291–332. doi:10.1080/02702710390227369
Carlisle, J. F., Goodwin, A. P., & Nagy, W. (2013). Morphological knowledge and literacy acquisition. Journal of Learning Disabilities, 47(1), 3–12. doi:10.1177/0022219413509967
Carlisle, J. F., McBride-Chang, C., Nagy, W., & Nunes, T. (2010). Effects of instruction in morphological awareness on literacy achievement: An integrative review. Reading Research Quarterly, 45, 464–487. doi:10.1598/RRQ.45.4.5
Carter, R., McCarthy, Mark, G., & O’keeffe, A. (2016). English grammar today. Cambridge, UK: Cambridge University Press.
Crosston, A. C., McKeown, M. G., Moore, D. W., & Ye, F. (2018). Extending the bounds of morphology instruction: Teaching Latin roots facilitates academic word learning for English learner adolescents. Reading and Writing, 1–39. doi:10.1007/s11145-018-9885-y
Deacon, S. H., & Kirby, J. R. (2004). Morphological awareness: “Just morphological awareness”?: The roles of morphological and phonological awareness in reading development. Applied Psycholinguistics, 25, 223–238. doi:10.1017/S0142261604001110
Diaz, I. (2010). The effect of morphological instruction in improving the spelling, vocabulary, and reading comprehension of high school English Language Learners (ELLs). (Doctoral Dissertation).Available from ProQuest Dissertations and Theses. (UMI No.3405911)
Droop, M., & Verhoeven, L. (2003). Language proficiency and reading ability in first- and second-language learners. Reading Research Quarterly, 38(1), 78–103. doi:10.1598/RRQ38.1.4
Ellis, R. (2001). Introduction: Investigating form-focused instruction. Language Learning, 51(1), 1–46. doi:10.1111/1467-1770.2001.tb00013.x
Fotos, S. (1994). Integrating grammar instruction and communicative language use through grammar consciousness-raising tasks. TESOL Quarterly, 28, 323–351. doi:10.2307/3587436
Francesco, L. E., Bangs, K., & Binder, K. S. (2016). The contributions of phonological and morphological awareness to literacy skills in the adult basic education population. Journal of Learning Disabilities, 49(2), 140–151. doi:10.1177/00222194145338513
Goodwin, A. P., & Ahn, S. (2013). A meta-analysis of morphological interventions in English: Effects on literacy outcomes for school-age children. Scientific Studies of Reading, 17(4), 257–285. doi:10.1080/10888438.2012.689791
Hamavandi, M., Rezai, M. J., & Mazdayasna, G. (2017). Dynamic assessment of morphological awareness in the EFL context. Cogent Education, 4(1), 1324254. doi:10.1080/2331186X.2017.1324254
Jiang, Y., Kuo, L., & Sonnenburg-Winkler, S. L. (2015). Morphological awareness and reading comprehension: A qualitative study with adult EFL learners. International Journal of Language and Linguistics, 2 (5), 18–26.
Katz, L. A. (2004). An investigation of the relationship of morphological awareness to reading comprehension in fourth and sixth graders. (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3138192).
Kieffer, M. (2009). The development of morphological awareness and vocabulary knowledge in adolescent language minority learners and their classmates.
Amirjali & Jabbari, Cogent Education (2018), 5: 1523975
https://doi.org/10.1080/2331186X.2018.1523975

(Doctoral Dissertation). Available from ProQuest Dissertations and Theses database. (UMI No.3385022).

Kuo, L., & Anderson, R. C. (2006). Morphological awareness and learning to read: Across-language perspective. Educational Psychologist, 41, 161-180. doi:10.1027/1532-6985sep1203_3

Lee, L., & Gundersen, E. (2011). Select readings. Oxford, UK: Oxford University Press.

Levesque, K. C., Kieffer, M. J., & Deacon, S. H. (2017). Morphological awareness and reading comprehension: Examining mediating factors. Journal of experimental child psychology, 160, 1-20. doi:10.1016/j.jecp.2017.02.015

Levesque, K. C., Kieffer, M. J., & Deacon, S. H. (2018). Inferring meaning from meaningful parts: The contributions of morphological skills to the development of children’s reading comprehension. Reading Research Quarterly. doi:10.1002/rq.219

Lo, Y., Anderson, A. L., & Bunch-Crump, K. (2017). Building vocabulary of English learners with reading disabilities through computer-assisted morphology instruction. Intervention in School and Clinic, 52(3), 133-140. doi:10.1177/1053451216676729

Logan, B. (2010). The role of morphological awareness in the reading development of English language learners. (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database. (UMI No.3421878).

Loudermill, S. C. (2014). An investigation of the relationship between reading comprehension and morphological awareness skills. (Doctoral Dissertation). Available from ProQuest Dissertations and Theses database. (UMI No.3621689).

Mahony, D., Singson, M., & Mann, V. (2000). Reading ability and sensitivity to morphological relations. Reading and Writing: an Interdisciplinary Journal, 72(3), 191-218. doi:10.1023/A:1008136012492

Mahony, D. L. (1994). Using sensitivity to word structure to explain variance in high school and college level reading ability. Reading and Writing: an Interdisciplinary Journal, 6(1), 18-44. doi:10.1007/BF01027776

Masterson, J., & Hayes, M. (2004). UK data from 197 under graduates for the Nelson-Denny reading test. Journal of Research in Reading, 27, 30-35. doi:10.1111/j.1467-9817.2004.02112.x

McCutchen, D., Green, L., & Abbott, R. D. (2008). Children’s morphological knowledge: Links to literacy. Reading Psychology, 29(4), 289–314. doi:10.1080/02702710801982050

McLeod, A. N., & Apel, K. (2015). Morphological awareness intervention study of a child with history of speech and language disorders. Communication Disorders Quarterly, 36(4), 205-218. doi:10.1177/1525740115600371

Nagy, W., & Townsend, D. (2012). Words as tools: Learning academic vocabulary as language acquisition. Reading Research Quarterly, 47, 91-108. doi:10.1002/rrq.011

Nagy, W. E., & Inman, J. (2006). Contributions of morphology beyond phonology to literacy outcomes of upper elementary and middle school students. Journal of Educational Psychology, 95(1), 134-147. doi:10.1037/0022-0663.98.1.134

Nagy, W. E., Berming, V., Abbott, R., & Vaughan, K. (2003). Relationship of morphology and other language skills to literacy skills in at-risk second-grade readers and at-risk fourth-grade writers. Journal of Educational Psychology, 95(4), 730–742. doi:10.1037/0022-0663.95.4.730

Nation, I. S. P. (2001). Learning vocabulary in another language. Cambridge, England: Cambridge University.

Perfetti, C. A. (2007). Reading ability: Lexical quality to comprehension. Scientific Studies of Reading, 11, 357–383. doi:10.1080/10888430701530730

Proctor, C. P., Carlo, M., August, D., & Snow, C. E. (2005). Native Spanish-speaking children reading in English: Toward a model of comprehension. Journal of Educational Psychology, 97, 246–256. doi:10.1037/0022-0663.97.2.246

Schmidt, R. (1990). The role of consciousness in second language learning. Applied Linguistics, 11, 129–158. doi:10.1093/applin/11.2.129

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), Cognition and second language instruction (pp. 3–32). Cambridge, UK: Cambridge University.

Scott, J. A., & Nagy, W. E. (2004). Developing word consciousness. J. F. Baumann & E. J. Kame'enui (Eds.), Vocabulary instruction: Research to practice (pp. 201-217). New York, NY: The Guilford.

Shoeb, A. (2017). Morphological awareness and its association with reading comprehension of EFL Saudi university students. European Journal of English Language Teaching, 3(2), 52-77. doi:10.2581/teno.11174715

Singson, M., Mahony, D., & Mann, V. (2000). The relationship between reading ability and morphological skills: Evidence from derivational suffixes. Reading and Writing: an Interdisciplinary Journal, 12, 219-252. doi:10.1023/A:1008196330239

Swain, M. (1998). Focus on form through conscious reflection. In C. Doughty & J. Williams (Eds.), Focus on form in classroom second language acquisition (pp. 64–81). Cambridge, UK: Cambridge University Press.

Tighe, E. L., Little, C. W., Arrastia-Chisholm, M. C., Schatschneider, C., Diehm, E., Quinn, J. M., & Edwards, A. A. (2018). Assessing the direct and indirect effects of metalinguistic awareness to the reading comprehension skills of struggling adult readers. Reading and Writing, 1–32.

Tyler, A., & Nagy, W. E. (1989). The acquisition of English derivational morphology. Journal of Memory and Language, 28, 649-667. doi:10.1016/0796-0833(89)90002-8

Yucel-Koc, M. (2015). The role of morphological awareness in academic vocabulary and reading comprehension skills of adult ESL learners. (Doctoral Dissertation). Available from ProQuest Dissertation and Theses database. (UMI No.3664492).

Zhang, D. (2010). Derivational morphology in reading comprehension of Chinese-speaking learners of English: A longitudinal structural equation modeling study. Applied Linguistics, 38(1), 871–895.

Zhang, D., & Koda, K. (2012). Contribution of morphological awareness and lexical inferencing ability to L2 vocabulary knowledge and reading comprehension among advanced EFL learners: Testing direct and indirect effects. Reading and Writing, 25(5), 1195–1216. doi:10.1007/s11116-011-9313-2
## Table A1. Based words, suffixes, and derived word taught in each instruction session.

| Week 1 | Target suffix | Base words | Derived words | Rules |
|--------|---------------|------------|---------------|-------|
|        | -er/or        | Drive       | Driver        | Verb/noun+ er/or = noun |
|        | - er/or       | distribute  | Distributer   |       |
|        | - er/or       | Process     | Processor     |       |
|        | - er/or       | farm        | Farmer        |       |
|        | - less        | Sense       | Senseless     | Verb/noun+ less = adjective |
|        | - less        | Resist      | Resistless    |       |
|        | - less        | Measure     | Measureless   |       |
|        | - less        | Meaning     | Meaningless   |       |
|        | - ness        | Polite      | Politeness    | Adjective+ ness = noun |
|        | - ness        | Bright      | Brightness    |       |
|        | - ness        | Happy       | Happiness     |       |
|        | - ness        | Ready       | readiness     |       |
| Week 2 | Target suffix | Base words | Derived words | Rules |
|        | - ance/ence   | Continue    | Continuance   | Verb+ ance/ence = noun |
|        | - ance/ence   | Differ      | Difference    |       |
|        | - ance/ence   | Occur       | Occurrence    |       |
|        | - ance/ence   | Resist      | Resistance    |       |
|        | - ful         | Purpose     | Purposeful    | Noun/verb+ ful = adjective |
|        | - ful         | Beauty      | Beautiful     |       |
|        | - ful         | Waste       | Wasteful      |       |
|        | - ful         | Duty        | Dutiful       |       |
|        | - en          | Dark        | Darken        | Adjective+ en = verb |
|        | - en          | Weak        | Weaken        |       |
|        | - en          | White       | Whiten        |       |
|        | - en          | Loose       | Loosen        |       |
| Week 3 | Target suffix | Base words | Derived words | Rules |
|        | - ment        | Agree       | Agreement     | Verb+ ment = noun |
|        | - ment        | Manage      | Management    |       |
|        | - ment        | Argue       | Argument      |       |
|        | - ment        | Improve     | Improvement   |       |
|        | - ive         | Adjust      | Adjustive     | Verb/noun+ ive = adjective |
|        | - ive         | Product     | Productive    |       |
|        | - ive         | Absorb      | Absorptive    |       |
|        | - ive         | compete     | Competitive   |       |
|        | - y           | Cloud       | Cloudy        | Noun/verb+ y = adjective |
|        | - y           | Rain        | Rainy         |       |
|        | - y           | Bag         | Baggy         |       |
|        | - y           | Leak        | Leaky         |       |
| Week 4 | Target suffix | Base words | Derived words | Rules |
|        | - sion/tion   | Add         | Addition      | Verb+ sion/tion = noun |
|        | - sion/tion   | Operate     | Operation     |       |
|        | - sion/tion   | Discuss     | Discussion    |       |
|        | - sion/tion   | Attract     | Attraction    |       |
|        | - able/ible   | Vary        | Variable      | Verb/noun+ able/ible = adjective |
|        | - able/ible   | Demonstrate | Demonstrable  |       |
|        | - able/ible   | Depend      | Dependable    |       |
|        | - able/ible   | Reason      | Reasonable    |       |
|        | - ify         | Mode        | Modify        | Noun/adjective+ ify = verb |
|        | - ify         | Note        | Notify        | adjective bases were not allowed |
|        | - ify         | Desert      | Desertify     |       |
|        | - ify         | Object      | Objectify     |       |
| Week 5 | Target suffix | Base words | Derived words | Rules |

(Continued)
| Table A1. (Continued) |
|-----------------------|
| **-ee** | **Employ** | **Employee** | **Verb/noun+ ee = noun** |
| **Test** | **Testee** |
| **License** | **Licensee** |
| **Promise** | **Promisee** |
| **-ry/ory/ery** | **Minister** | **Ministry** | **Noun/verb+ ry = noun** |
| **Enter** | **Entry** |
| **Direct** | **Directory** |
| **Function** | **Functionary** |
| **-ship** | **Friend** | **Friendship** | **Noun+ ship = noun** |
| **Leader** | **Leadership** |
| **Relation** | **Relationship** |
| **Owner** | **Ownership** |

| Week 6 | Target suffix | Base words | Derived words | Rules |
|-------|----------------|------------|---------------|-------|
| **-ize** | **Computer** | **Computerize** | **Noun/adjective+ ize = verb** |
| **Active** | **Activize** |
| **Character** | **Characterize** |
| **Economy** | **Economize** |
| **-ish** | **Girl** | **Girlish** | **Noun+ ish = adjective** |
| **Book** | **Bookish** |
| **Cat** | **Cattish** |
| **Club** | **Clubbish** |
| **-dom** | **King** | **Kingdom** | **Noun/adjective+ dom = noun** |
| **Free** | **Freedom** |
| **Wise** | **Wisdom** |
| **Self** | **Selfdom** |

| Week 7 | Target suffix | Base words | Derived words | Rules |
|-------|----------------|------------|---------------|-------|
| **-ous** | **Disaster** | **Disastrous** | **Noun+ ous = adjective** |
| **Industry** | **Industrious** |
| **Danger** | **Dangerous** |
| **Joy** | **Joyous** |
| **-ist** | **Active** | **Activist** | **Noun/adj+ ist = noun** |
| **Economy** | **Economist** |
| **Education** | **Educationist** |
| **General** | **Generalist** |
| **-ic** | **Base** | **Basic** | **Noun+ ic = adjective** |
| **Economy** | **Economic** |
| **Period** | **Periodic** |
| **Artist** | **Artistic** |

| Week 8 | Target suffix | Base words | Derived words | Rules |
|-------|----------------|------------|---------------|-------|
| **-ly(adj)** | **Day** | **Daily** | **Noun+ ly = adjective** |
| **Friend** | **Friendly** |
| **Brother** | **Brotherly** |
| **World** | **Worldly** |
| **-ly(adv)** | **Day** | **Daily** | **Noun/adj+ ly = adverb** |
| **Annual** | **Annually** |
| **Live** | **Lively** |
| **Anger** | **Angrily** |
| **-hood** | **Child** | **Childhood** | **Noun/adj+ hood = noun** |
| **Brother** | **Brotherhood** |
| **Lively** | **Liveliness** |
| **Likely** | **Likelihood** |

| Week 9 | Target suffix | Base words | Derived words | Rules |
|-------|----------------|------------|---------------|-------|
| **-all(noun)** | **Arrive** | **Arrival** | **Noun/verb+ all = noun** |
| **Deny** | **Denial** |
| **Reverse** | **Reversal** |
| **Propose** | **Proposal** |

(Continued)
-al (adjective)  Center  Central  Noun + al = adjective
-ity/ty   Active  Activity  Adjective + ity/ty = noun
Week 10  Target suffix  Base words  -ate

Note. For some suffixes, we could not find opaque derived words (e.g., -less; all examples are transparent) either because they did not exist or because one could not be found within the frequency of selected base words. The same was true for suffixes for which we could not find transparent derived words (e.g., -ate; all examples are opaque). Some base words were themselves derive words. For example, the word “active” has been used as the base of the word activity. It is noted that (1) the word active itself was among the 3000 most common words used in writing, therefore frequency of the base was considered, (2) if the word “active” was used as the base, the suffix —ive had been taught during the same or previous sessions, and (3) such derived words were commonly used as the base with the selected suffix (e.g., -ity) and the researcher felt the need to expose the learners to such base words.

Table A2. Sample of cumulative word charts

| Verb        | Noun                          | Adjective            | Adverb                  |
|-------------|-------------------------------|----------------------|-------------------------|
| Operate     | Operation                     | Operational, operative |                         |
| Produce     | Productivity, production      | Productive           |                         |
| Act         | Action                        | Active               |                         |
| Identify    | Identification, Identity      | Identical            |                         |
| Educate     | Educationist                  | Educational          | Educationally           |
| Regulate    | Regulation, regularity        | Regular              |                         |
| Resist      | Resistance, resistivity       | Resistless           |                         |
| Differ, differentiate | Difference | Different |                         |
| Beautify    | Beauty                        | Beautiful            | Beautifully             |
| Distribute  | Distributor                   | Distributive         |                         |
| Economize   | Economy, economist            | Economic             | Economically            |
| Manage      | Management                    | Manageable, managerial|                         |
| Test        | Test, tester, testee          | Testable             |                         |
| Accept      | Acceptability                 | Acceptible           |                         |
| Demonstrate | Demonstration, demonstrator   | Demonstrable         |                         |
| Relate      | Relationship                  | Relational           |                         |
| Create      | Creationism                   | Creative             | Creatively              |
| Historicize | Historian                     | Historical           | Historically            |
| Deny        | Denial                        | Deniable             |                         |

Note. Only the derived words and parts of speeches covered during the review sessions have been included in the table.
