

## Effects of Word–Writing in Contextual Word Learning on Korean High School Students’ L2 Vocabulary Learning\*

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Yoo, Suneun and Hyunsook Yoon. 2019. Effects of word–writing in contextual word learning on Korean high school students’ L2 vocabulary learning. *Korean Journal of English Language and Linguistics* 19–4, 713–735. While word–writing has been considered an example of rote learning, it is an L2 vocabulary learning strategy still commonly used by learners. As previous studies produced mixed findings regarding its effect on word learning, there is a strong need for more research on the effectiveness of word–writing. The present study aims to examine the short– and long–term effects of word–writing in contextual word learning depending on participants’ proficiency. Twenty–eight Korean high school students learned 12 target words in meaning–inferencing condition and the other 12 words in the word–writing condition. Right after learning the target words, they were given immediate meaning and form recall tests, followed by delayed tests in two weeks. The findings revealed that word–writing resulted in superior immediate meaning and form recall compared to meaning–inferencing, but the effect did not last for the long–term. Also, high–level learners gained more effects of word–writing than low–level learners in the immediate meaning recall test. The study suggests that word–writing in contextual word learning should not be considered an outdated vocabulary learning strategy but be encouraged for young learners to use properly in an L2 classroom.

**Keywords:** word writing, meaning inferencing, contextual word learning

### 1. Introduction

The majority of L2 vocabulary studies have focused on learning novel words in a meaning–inferencing way by providing learners with opportunities for semantic elaboration (Chang and Millett 2017, Xu, Xiong and Qin 2018). A similar situation has occurred in Korea, showing L2 vocabulary studies have focused on improving vocabulary knowledge through meaning–inferencing strategies (Cha 2009, Shin 2003).

As with this increased interest in semantic elaboration, there have been unfavorable

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opinions about word-writing as a representative example of meaningless rote learning in the second language (L2) education setting. Despite these negative views on word-writing, however, Korean L2 learners commonly use word-writing to learn vocabulary. Some research showed that the most prevalent vocabulary learning strategy used by Korean secondary school students was word-writing (Kim and Shim 2007, Lee and Min 2006). Moreover, when new words are introduced in the classroom, teachers usually promote L2 learners to write them down. This indicates that word-writing is still acknowledged as a useful way to learning vocabulary (Webb and Piasecki 2018). An important pedagogical question then is how we can use word-writing strategy effectively for successful L2 vocabulary learning.

Whereas early previous studies (Barcroft 2006, 2007, Xu, Chang, Zhang and Perfetti 2013) advised against word writing in vocabulary learning, two recent studies (Candry, Elgort, Deconinck and Eyckmans 2017, Elgort, Candry, Boutorwick, Eyckmans and Brysbaert 2016) demonstrated the effect of word-writing in contextual word learning. Contextual word learning (CWL) means trying to learn meanings of unfamiliar words in context (Elgort, Brysbaert, Stevens and Assche 2018). Elgort et al. (2016) showed that the word-writing condition in CWL yielded higher scores from the immediate form and meaning recall tests than the meaning-inferencing condition, irrespective of the learners' native writing system such as Chinese (logographic) or Dutch (alphabetic). Candry et al. (2017) reiterated the same result with Dutch learners of English, validating the advantage of word-writing in CWL compared to meaning-inferencing.

While the two studies cogently argued for the effectiveness of word-writing in vocabulary learning, there are some limitations. Most of all, the order of the learning procedure in both studies can be problematic because participants went through the same learning procedure regardless of the learning conditions (i.e., word-writing and meaning-inferencing). They first read a sentence including the target word and listened to its pronunciation (the familiarization phase). Next, they read the same sentence and then wrote the target word as many times as they could (Trial 1). Then, they read a new sentence and then wrote the target word repeatedly (Trial 2). Lastly, participants learned the definition of the target word (definition). It seems clear that the participants, although they were in the word-writing condition, would spend more of their time inferring the meaning of a target word rather than writing it because the definition of the word was provided in the last phase. It is also very unnatural to write a new word form without knowing the meaning of the word.

Secondly, these studies did not examine the long-term effects of word-writing. If word-writing is guaranteed an effective vocabulary learning technique for L2 learners, it is necessary to know whether the method is really helpful in the long run. Lastly, participants' proficiency was not taken into account in either study. In order to provide a more accurate and detailed implication, it is important to examine the effects of word-writing depending on the learner's proficiency.

In sum, the present study was designed to fill these research gaps. This study adopted a modified order of learning procedure in word-writing condition (i.e., a definition phase first, a familiarization phase second, Trial 1 third, and Trial 2 last) in order to examine the short- and long-term effects of word-writing in CWL when Korean students at different proficiency levels learn novel L2 vocabulary.

## 2. Literature review

### 2.1 Word-Writing in Contextual Word Learning

It is generally agreed that a great portion of L1 vocabulary can be incidentally acquired through reading (Krashen 1985, Nagy 1997, Nagy, Herman and Anderson 1985). When readers encounter an unfamiliar word while reading a text, they attempt to infer its meaning from context, i.e., CWL. A study found that students learned about 15 percent of unknown words through reading (Swanborn and De Glopper 1999).

In contrast, L2 empirical studies have shown that L2 learners incidentally acquire only a limited number of words at a very slow pace through reading (Nation 2013, Read 2004). They do not always guess the meaning of words successfully (Hulstijn 2001). Also, it is quite difficult to provide them with adequate input and sufficient encounters with unfamiliar words in formal L2 learning contexts where there is no enough time for L2 learning.

Therefore, new word learning strategies have been investigated for effective CWL (Elgort, Perfetti, Rickles and Stafura 2015, Schmitt 2008, Webb 2007). A key point of such CWL strategies is to provide learners with *meaningful* contexts for inferring the meaning of unfamiliar words of the text. However, new CWL strategies can still be problematic for L2 learners in that a few encounters with a word is not sufficient for them to guess its core meaning, even in an informative context. Even for native speakers, three to four encounters in supportive single-sentence contexts are needed

(Bolger, Balass, Landen and Perfetti 2008). The other problem is that these CWL strategies make L2 learners insufficiently process the form of an unfamiliar word as they spend their time on inferring the meaning (Lawson and Hogben 1996, Pressley, Levin and McDaniel 1987). Therefore, CWL may not always strengthen form-meaning mapping.

Some researchers argue that L2 learners' direct attention to a target word can compensate for the weakness of CWL (Laufer 2005, Schmitt 2008). Elgort et al. (2016) compared outcomes of two deliberate learning procedures: explicitly inferring word meanings and writing word forms, both in a CWL situation. Two different learner groups participated in their study: Chinese speakers as an example of a non-alphabetic L1 system in the first experiment and Dutch as an example of an alphabetic L1 system in the second experiment. The results of their study showed that word-writing condition had a more positive effect on L2 vocabulary learning than meaning-inferencing condition, regardless of the learners' native writing system. Later, Candry et al. (2017) also confirmed that word-writing in a CWL setting is more effective for word learning than the meaning-inferencing. That is, the two studies demonstrated that word-writing in CWL resulted in the stronger form-meaning mapping of words than meaning-inferencing.

In contrast, there have been early studies advising against word writing in vocabulary learning. In Barcroft (2006), English-speaking learners of Spanish were asked to learn 24 unfamiliar Spanish words via word-picture repetitions (12 by word-writing and 12 by no-writing). The results of the study found that the no-writing condition produced higher word learning scores than the word-writing condition. Similarly, Barcroft (2007) found that no-writing condition produced higher means on productive and receptive vocabulary learning than the word-writing and fragment-writing condition. Through these experiments, he concluded that just copying words negatively affects word learning because "this type of forced output without access to meaning can detract from word learning by exhausting processing resources needed to encode novel lexical forms" (Barcroft, 2006, p. 487). However, it should be noted that the participants in his study were asked to learn the new words by pictures without access to specific meaning, that is, without any textual context. More recently, Xu et al. (2013) showed that the reading condition outperformed the word-writing condition in sound and meaning recognition test, but the participants in their study were also asked to learn the target words with no contextual support. In other words, these studies inform that just writing words repeatedly without any context has little

effect on form-meaning mapping of the words. Therefore, providing informative contexts appears to have an important impact on determining the effectiveness of word-writing. A problem, here, is that only a few studies have thus far examined the effects of word-writing in CWL.

## 2.2 The Effects of Word-Writing on Vocabulary Learning

The effect of word-writing can be explained by Lexical Quality Hypothesis and motor memory trace. First, the assumption that word-writing is an essential strategy in L2 word learning is based on the Lexical Quality Hypothesis (Perfetti 2007, Perfetti and Hart 2002). Lexical quality (LQ) refers to the extent to which the reader's understanding of a given word represents the word's form and meaning (Perfetti 2007). There are three constituents of LQ: the orthographic, phonological, and semantic specifications of the word (Perfetti and Hart 2002). The identification of the word is the retrieval of these word constituents. Therefore, a high-quality representation is indicated by a tightly bonded set of word constituents. For instance, when someone distinguishes the difference between two orthographically similar words, such as *carton* and *cartoon*, a person with a higher lexical quality more easily recognizes the difference between the two words. This is because a high-quality representation of a word's orthography can lead to more rapid and precise word identification than that of a low-quality representation. High-quality lexical representations minimize confusion about word-form and meaning.

LQ hypothesis informs us that all three elements that consist of a word need to be handled importantly when students are learning a new word. A vocabulary learning method which focuses only on the meaning of a word might not be an effective vocabulary learning method when it comes to assisting L2 learners to have a higher lexical quality. Looking at Candry et al. (2017) and Elgort et al. (2016), both word-writing and meaning-inferencing learning conditions allowed the learners to focus on phonology by including an audio recording of a target word and a definition by suggesting two sentences in which the target word was used. However, orthographical focus was included only in the word-writing condition. The learner could build more qualitative lexical representation in the word-writing condition where the three elements of lexical quality were combined than in the meaning-inferencing condition. Word-writing in CWL is therefore a necessary technique for L2 learners because it can fulfill all three factors of lexical quality.

Secondly, word-writing is a process of creating and retaining an image with attention to handwritten items, running a motor program to reproduce the image, and then receiving visual feedback from the created items (Søvik 1981, Thomassen and Teulings 1983). Therefore, such a process of word-writing produces a richer memory trace than just looking at a word.

A number of researchers have discovered that the particular movements produced by writing the word generate motor memory, which aids subsequent recognition (James and Engelhardt 2012, Longcamp, Serbato-Poudou and Valay 2005) and free recall (Naka 1998, Naka and Naoi 1995). For instance, Naka and Naoi (1995) found that graphic designs were better memorized when children learned them by writing, rather than only looking, regardless of their L1. Replicating this result, Naka (1998) asserted that characters and letters were better recalled through writing. In addition, handwriting training was shown to improve letter recognition better than the typing training because hand movements play a crucial role in the visual recognition of letters (Longcamp et al. 2005).

The motor memory may be created when the word is written a sufficient number of times. Candry et al. (2017) claimed that the number of times that a word is written can be an essential factor to establish the motor trace in memory. Webb and Piasecki (2018) re-examined Barcroft's study (2006) showing a negative effect of word-writing. In the study, participants were asked to learn target vocabulary in a word-writing task with a limited time condition (two times). Webb and Piasecki instead used a word-writing task with an unlimited time condition and found that participants had much higher scores when they learned target words with an unlimited time condition than in the other conditions. They pointed out that the number of times target words were written had a significant impact on the results. To sum up, continued action in repetitive writing appears to stimulate the generation of motor memory to assist the subsequent memory of a word.

### **3. Methodology**

#### **3.1 Research Questions**

The main purpose of the study was to examine the effectiveness of word-writing in CWL, with some modification in the order of learning phases from the previous studies

(Candry et al. 2017, Elgort et al. 2016). Also, this study analyzed the effects of word-writing depending on the type of tests and the level of participants' English proficiency so as to examine the effects of word-writing from various angles. The research questions that guided this study are as follows:

- 1) Does word-writing in CWL result in superior meaning and form recall compared to meaning-inferencing in the immediate and delayed test?
- 2) Does the effectiveness of word-writing in CWL differ depending on the proficiency of the participants?

### **3.2 Participants**

The participants of the study were 29 first year high school students in a middle region of the country, but data from 28 students were analyzed because one student did not attend the English placement test. The English placement test is designed to examine incoming students' proficiency in order to place multiple levels of students in one class. It mainly consists of questions to determine their English reading, grammar, and vocabulary skills. All participants were male in the same class. They were later split into high and low levels for data analysis, according to English placement test scores gained at the school right before the experiment. The mean score of the test was 61.25. If a learner's score was under the mean, the student was assigned to low-level, and vice versa. A within-subjects design was used for allowing a participant to learn the target words in all learning conditions. That is, all participants learned 24 target words in two different conditions: a word-writing condition and a meaning-inferencing condition.

### **3.3 Target Words**

The previous studies (Candry, et al. 2017, Elgort, et al. 2016) used both low-frequency and pseudo words to exclude the words already known to the participants, but the present study used unknown, but useful, words for their future study to enhance ecological validity. In order to select target words, 100 essential English words for the third-year Korean high school students were collected to be used in a pre-test. They were all nouns and pertained to the vocabulary from various domains (e.g., *body, personality, emotion, politics, law, jobs, science, math, directions,*

etc.). Through the pre-test, 24 words that the participants even did not attempt to guess were chosen as the target words (e.g., *testimony, offspring, nourishment, petal*). The average number of letters for 12 words in the meaning-inferencing condition was 7.42, and 7.5 in the word-writing condition. The target words were shown three times in context and once with their definition. All 24 target words were in bold and placed between brackets (i.e., {}) to stand out. Sentences needed for each word were extracted from the Corpus of Contemporary American English and modified to match the participants' level. For instance, long and unfamiliar proper nouns were replaced with short and familiar ones, and grammatically too complex sentences were also modified to simple structures.

### 3.4 Procedure

First, the participants were told what the experiment involved and were asked to sign a consent form. After completing the consent form, the participants took a pre-test to determine the 24 target words. Students were given 100 words and asked to check 'yes' (if they know the word) or 'no' (if they do not know the word). If participants answered 'yes,' they were asked to write down the meaning of the word in Korean.

One week later, the participants were briefed that they would learn 24 unknown English words in four separate categories (A, B, C, and D); each category had six target words. Students were asked to learn each category in different conditions because the order in which target words were presented to participants was considered as a variable that could influence the results. In other words, it was expected that the words met just before the tests would be better remembered. Three practice trials were performed by participants to ensure that all of them fully understood the learning procedure.

After the briefing, the learning procedure initiated. The order of the four phases was differently presented according to the learning conditions. Table 1 shows the order of phases in each condition depending on the category. Power Point presentations were used in order to operate the learning procedure.

**Table 1. Learning Procedure Depending on Categories**

Category	Condition	The presented order of the phases
A & C	MI	Familiarization, Trial 1, Trial 2, and Definition
B & D	WW	Definition, Familiarization, Trial 1, and Trial 2

*Note.* MI = Meaning-inferencing; WW = Word-writing

In the meaning-inferencing condition for the 12 words in categories A and C, firstly a target word was presented in a sentence context as a familiarization phase. In this phase, the participants were asked to read the sentence and listen to the target word three times for 30 seconds. Through the familiarization phase, all participants could have a tentative idea of the meaning of the target words. Next, in the learning treatment (Trial 1), the participants were again exposed to the target words in the same sentence contexts that were used in the familiarization phase. The participants were asked to derive the meaning of the target word from the sentence's context. They were granted 30 seconds to read the complete sentence and write their guesses down on a paper booklet. Then, the learning treatment (Trial 2) was repeated with the slight difference that the target words were placed in another sentence context. This means that the participants encountered the target words in two different sentence contexts during the learning procedure. Lastly, in the definition phase, the participants encountered the definition in Korean (L1) of the target word for ten seconds. Subsequently, all target words were presented to the participants for the fourth time for 100 seconds.

On the other hand, in the word-writing condition for the 12 words in categories B and D, firstly, participants were provided with definitions of the target words for ten seconds each. Next, in the familiarization phase, they were asked to read the sentence and listen to the target words three times for 30 seconds each. Then, the participants were again provided with the same sentence used in the familiarization phase and asked to repeatedly write down the word to learn its spelling in the learning treatment (Trial 1). They could read the entire sentence and then repeatedly write the target word by hand onto a paper booklet for 30 seconds. The learning treatment (Trial 2) was repeated with a different sentence for 30 seconds. Each time the screen changed, a specific bell sound was generated to inform the participants that the screen was changing in order to avoid confusion.

As soon as the learning procedure finished, the participants took a meaning recall test. A meaning recall test was performed to measure the participants' receptive knowledge. A paper with room for writing down the meanings of 24 words was

presented to the participants for this test. First, the participants listened to the same audio files of 24 target words used in the familiarization phase of the learning treatment phase. Then, the participants were asked to write an answer in Korean, and this process continued until all 24 words are covered. The target words were presented randomly to avoid the memory effects from the learning phase.

After completing the meaning recall test, a form recall test was administered to measure the participants' productive knowledge of the vocabulary. There were 24 fill-in-the-blank sentences in the test paper. The sentences were different from the ones used in the learning procedure. The Korean (L1) translations of the target words as well as the first letter of the target words were provided to the participants in order to ensure that they would not resort to providing equivalents of the target words that were not learned in the present study.

Two weeks later, the same meaning and form recall tests were administered to measure the delayed effects of learning new L2 vocabulary in different conditions. For the two delayed tests, the same sentences used in the immediate tests were used, but the target words were presented in a different order.

After completing the delayed tests, a survey proceeded as the last procedure of the study in order to examine the participants' perspectives on the learning strategies. First, they were asked to list how they usually study vocabulary. Some Korean examples (e.g., writing a word or inferring a word) were provided to help participants come up with their answers. Next, participants were asked to choose either meaning-inferencing or word-writing to identify their preference. Lastly, there was a question about their perspectives related to the effectiveness of the two conditions. The entire procedure is displayed in Figure 1.

### **3.5 Data Analysis**

Binary scoring was implemented for the immediate meaning and form recall test and the delayed meaning and form recall test. If an answer was entirely correct, a score of 1 was awarded. On the other hand, a score of 0 was given to an incorrect response.

To verify the statistical significance of the results of the immediate and delayed tests, two-way repeated measures ANOVAs were used as an analysis tool with two independent variables such as the learning conditions (i.e., meaning-inferencing and word-writing conditions) and the two tests (i.e., immediate and delayed tests).

Thereafter, pairwise comparisons were used to determine which of the two variables had a major effect on the score as a post hoc analysis.

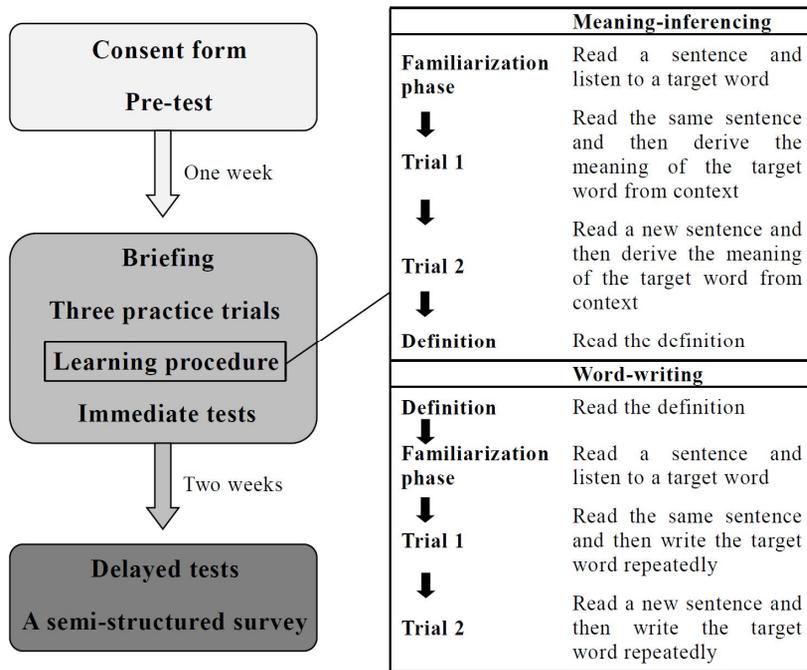


Figure 1. The Overview of Procedure

## 4. Results and Discussion

### 4.1 The Effects of Learning Conditions on Meaning Recall of the Vocabulary

Table 2 demonstrates the average scores of the participants per condition and test. Overall, the scores were higher for words learned in the word-writing condition than in the meaning-inferencing condition, regardless of the type and the time of tests. For clarity of presentation, the findings of the meaning recall and form recall tests are discussed separately.

**Table 2. Mean Scores of Meaning and Form Recall Tests** (max score=12)

	Immediate test		Delayed test	
	MI ( <i>n</i> =28) <i>M</i> ( <i>SD</i> )	WW ( <i>n</i> =28) <i>M</i> ( <i>SD</i> )	MI ( <i>n</i> =28) <i>M</i> ( <i>SD</i> )	WW ( <i>n</i> =28) <i>M</i> ( <i>SD</i> )
Meaning recall	2.93 (2.28)	5.14 (3.18)	1.71 (2.12)	1.93 (1.80)
Form recall	2.21 (1.89)	3.57 (2.59)	1.10 (1.69)	1.43 (1.93)

*Note.* MI = Meaning-inferencing; WW = Word-writing

The meaning recall tests showed that word-writing condition in CWL produced higher means than meaning-inferencing condition in both immediate and delayed tests. The results of ANOVA revealed significant main effects for learning conditions  $F(1, 27) = 39.55, p = .000$ , and also tests,  $F(1, 27) = 14.92, p = .001$ . Furthermore, a significant effect is observed for the interaction between the two variables,  $F(1, 27) = 17.18, p = .000$ , suggesting that participants performed differently on the tests in the two conditions. Post hoc analyses showed that the effect of word-writing was much greater than that of meaning-inferencing in the immediate test ( $t(27) = -4.77, p < .001$ ).

The result of immediate meaning recall test is in contrast to Barcroft (2006, 2007) and Xu et al. (2013). This contradictory result on the effectiveness of word-writing in a meaning recall test can first be explained by the provision of supportive contexts to the learners. If initial supportive contextual encounters with a new word leave a memory trace of both a word and its context, multiple encounters with the same word in different contexts can lead to stable form-meaning mapping. That is, word-writing in CWL led to stronger form-meaning mapping of a word rather than word-writing with no context.

Second, this result can be due to the participants' incorrect guesses when they inferred the meanings of the target vocabulary in the learning procedure. An examination of the paper booklets used by participants found that many of them guessed the wrong meanings of the target words at first. For instance, the meaning of 'offspring' was written as 'provider' or 'present' in a student's booklet. Later, the participant corrected his guess after checking the definition of the word, but he got it wrong again in the meaning recall test. It confirms that inferring the meaning of the words cannot ensure that students make accurate guesses in semantic elaboration (Nation and Coady 1988, Wesche and Paribakht 2000) and they seem to store their first inaccurate answer in their memory (Hulstijn, Hollander and Greidanus 1996, Nagy et al. 1985).

Also, the design of the meaning recall test may have contributed to the learning of more vocabulary in word-writing conditions. The meaning recall test asks learners to recognize a word's form and then retrieve the meaning of the word (Candry et al. 2017). In other words, if the word form is not recognized by the learners, it is impossible for them to retrieve its meaning. It is likely that the participants were able to better understand the meaning of the words in the word-writing condition during the meaning recall test as the word-writing condition more accurately represents the word form.

Lastly, LQ hypothesis (Perfetti 2007) helps to explain the result. According to the hypothesis, phonology, orthography, and meaning are three constituents of a lexical entry, and having three constituents means high lexical quality. The participants were able to learn target words more accurately in word-writing condition as it adds focus on orthography. Therefore, it is recommended that students have a high lexical quality that meets the three constituents of a lexical entry in L2 vocabulary learning.

Another notable finding is that modification of the learning procedure's order in the present study raised the effects of word-writing. A small to moderate effect size was observed for scores of meaning recall test in Candry et al.'s (2017) study ( $z = 3.623$ ,  $p = .001$ ,  $d = 0.31$ ), but a high effect size was observed in the present study ( $t(27) = -4.77$ ,  $p < .001$ ). The modified learning procedure allowed the learners to have more opportunities to concentrate on the meaning of a target word as well as its form as they were given the definition of the word prior to word-writing. It may shorten the time needed to understand the context, which led to smoother translation from English to Korean and maximize the effects of word-writing.

On the other hand, word-writing was still helpful for word learning than the other condition in the delayed meaning recall test, but there was no statistical effect ( $t(27) = -0.68$ ,  $p < 1$ ). Learning through word-writing was steeply reduced ( $t(27) = 6.24$ ,  $p < .001$ ) than that of meaning-inferencing ( $t(27) = 3.86$ ,  $p < .01$ ) in the delayed test. That is, word-writing seemed to have a short-term but not a long-term effect for L2 vocabulary learning. This result, however, seems to be due to the lack of spacing effect. A number of studies on memory retention have found that spaced studying (i.e., studying information across two or more sessions that are separated in time) results in much better information retention compared to massed studying (i.e., studying information in a single session) (Carpenter, Cepeda, Rohrer, Kang and Pashler 2012). If learners want to retain long-term information, they should review the information a certain period of time after the initial learning. Cepeda, Vul, Rohrer,

Wixted and Pashler (2008) suggested that the ideal time to review information would be a few weeks or months after it was first learned. Hence, it may have been difficult to predict the long-term effect of word-writing because the participants of the current study learned the target words for only one day and took the delayed test two weeks later without an additional learning session.

#### **4.2 The Effects of Learning Conditions on Form Recall of the Vocabulary**

Similar to the results of the meaning recall tests, the results of the form recall tests also demonstrated that word-writing was a more effective L2 vocabulary learning method than meaning-inferencing, regardless of the test time. The ANOVA showed significant main effects for learning conditions,  $F(1, 27) = 63.75, p = .000$ , and tests,  $F(1, 27) = 13.47, p = .001$ , and significant interaction effects between learning conditions and test time,  $F(1, 27) = 10.27, p = .003$ . This indicates that the students performed differently on the test intervals in the two conditions. Post-hoc analyses revealed that the form recall test scores in the immediate test showed the most difference depending on the learning conditions ( $t(27) = -4.27, p < .001$ ).

Compared to Barcroft's (2006, 2007) studies showing the negative effect of word-writing, the superiority of word-writing condition in the present study's form recall tests comes from a few methodological differences between them. First, the participants in this study were given a familiarization phase that allowed them to process a target word in sentence contexts before they wrote the word. In contrast, the target words in Barcroft's studies were presented to the participants twice for six seconds in an isolated way, with only images related to the target words. That is, the familiarization phase seemed to have an impact on the favorable results of word-writing.

The number of words written can be another methodological difference. It has been found that hand movements ensued from word-writing create a richer motor memory and the number of times that the word is written can be an essential element in establishing this motor trace in memory (Webb and Piasecki 2018). The students in Barcroft's studies had to write a target word twice, but the students in the current study could write as many words as they wanted. It seems that the repeated word-writing made stronger motor memories than meaning-inferencing condition, which led to the positive effects of word-writing.

Notably, the scores of the form recall tests were lower than those of the meaning

recall tests in both the immediate and delayed tests. Before the experiment, it was predicted that the effect of word-writing would be more prominent in the form recall test than the meaning recall test because the similarity between learning and testing conditions is likely to have a positive effect on test performance (Morris, Bransford and Franks 1977). However, one of the interesting findings is that word-writing has a more positive impact on the meaning recall than the form recall test. One interpretation for this result is that receptive knowledge of a word is generally easier to acquire than productive knowledge of a word. According to Nation (2013), productive learning is more difficult because it requires extra learning about new spoken or written output patterns. Learners only need to know a few distinctive features of the form of an item for receptive use, while more accurate knowledge of the word form is required for productive use. Nonetheless, the bottom line is that word-writing still had a more positive impact on the form recall test than meaning-inferencing.

Word-writing in the delayed form recall test still helped L2 vocabulary learning more than meaning-inferencing condition, but there was no statistical effect ( $t(27) = -1.36, p < 1$ ). A great loss of learning effect was shown in both meaning-inferencing ( $t(27) = 5.17, p < .001$ ) and word-writing ( $t(27) = 7.18, p < .001$ ) condition. That is, there was no long-term effect on L2 vocabulary learning. Like the results of the mean recall test, it may have been difficult to expect a long-term effect for word-writing, because participants had taken a delayed form recall test without additional learning sessions. For long-term retention of knowledge, the information should be reviewed a certain period of time after the initial learning (Carpenter et al. 2012).

#### **4.3 The Effects of Word-Writing Depending on Students' Levels**

Table 3 provides the mean scores of the meaning recall test depending on the participants' levels. All the average scores of the high-level participants were higher than the low-level ones, regardless of the learning condition and the test time. It was also found that the effects of word-writing varied depending on the participants' levels, even though word-writing had positive effects on learning target words for all participants.

**Table 3. Mean Scores of Meaning Recall Tests Depending on Proficiency (max score=12)**

Group	N	Immediate test		Delayed test	
		MI <i>M (SD)</i>	WW <i>M (SD)</i>	MI <i>M (SD)</i>	WW <i>M (SD)</i>
High-level	14	3.57 (1.95)	6.79 (3.12)	2.21 (2.33)	2.29 (2.05)
Low-level	14	2.29 (2.46)	3.50 (2.35)	1.21 (1.85)	1.57 (1.50)

Note. MI = Meaning-inferencing; WW = Word-writing

Generally, high-level participants received more benefits from word-writing than low-level participants. The interaction between the learning conditions and the tests had a significant effect on the scores of high-level participants,  $F(1, 13) = 19.60$ ,  $p = .001$ . On the other hand, the interaction between the learning conditions and the time had no impact on scores for low-level participants,  $F(1, 13) = 2.80$ ,  $p = .118$ . Moreover, it was found that high-level participants received word-writing benefits in the immediate test with a moderate effect size ( $t(13) = -4.56$ ,  $p < .01$ ), but no effect was seen in the delayed test ( $t(13) = -0.14$ ,  $p < 1$ ). Likewise, low-level participants gained word-writing benefits in the immediate test with a small effect size ( $t(13) = -2.46$ ,  $p < .05$ ), but no effect in the delayed test ( $t(13) = -0.92$ ,  $p < 1$ ). The effect of word-writing seemed to be greatly reduced for both levels in the delayed meaning recall test.

Table 4 shows the mean scores of the form recall test by the participants' levels. As with the results of the meaning recall test, all the average scores of the high-level participants were higher than the low-level ones, regardless of the learning condition and the time of the tests. Also, the effects of word-writing varied depending on the levels of participants, although word-writing positively affected L2 vocabulary learning for all participants.

**Table 4. Mean Scores of Form Recall Tests Depending on Proficiency (max score=12)**

Group	N	Immediate test		Delayed test	
		MI <i>M (SD)</i>	WW <i>M (SD)</i>	MI <i>M (SD)</i>	WW <i>M (SD)</i>
High-level	14	3.07 (1.98)	4.57 (2.77)	1.93 (2.02)	2.07 (2.46)
Low-level	14	1.36 (1.39)	2.57 (2.03)	0.29 (0.61)	0.79 (0.89)

Note. MI = Meaning-inferencing; WW = Word-writing

Overall, high-level participants benefited slightly more from word-writing than low-level participants. The interaction of the learning conditions with the time had a significant effect on the scores of high-level participants,  $F(1, 13) = 8.55$ ,  $p = .012$ ,

while there is no statistical interaction effect between the learning condition and the time of tests,  $F(1, 13) = 2.52$ ,  $p = .136$ . Also, high-level participants benefited from word-writing in the immediate form recall test with a small effect size ( $t(13) = -4.56$ ,  $p < .05$ ), but no effect in the delayed test ( $t(13) = -0.14$ ,  $p < 1$ ). Low-level participants also obtained word-writing benefits in the immediate test with a small effect size ( $t(13) = -2.46$ ,  $p < .05$ ), but no effect in the delayed test ( $t(13) = -0.92$ ,  $p < 1$ ). In other words, the effect of word-writing appears to be significantly reduced for both levels in the delayed form recall test.

The results showed that high-level participants had statistically more learning effectiveness through word-writing, at least in the immediate meaning recall test. Initially, it was predicted that word-writing would be a more effective strategy for low-level participants because a meaning-inferencing strategy can be too difficult for them to use with their smaller L2 vocabulary size. However, the results of the present study may provide evidence for the Matthew effect, which states that learners who have a larger vocabulary size can acquire more new vocabulary (Candry et al. 2017, Elgort et al. 2015, Penno, Wilkinson and Moore 2002, Stanovich 1986). It seems that high-level students used better word-writing strategies than low-level students.

When participants were asked to answer their English vocabulary learning strategies in the survey, it was found that high-level students had experience using more various L2 vocabulary learning strategies than low-level students. Most low-level students (9 students of 14) responded that they had memorized unfamiliar words by just writing these words, while the high-level students stated that they had used various L2 vocabulary learning strategies, such as word-writing, meaning-inferencing, pronouncing words, self-testing, and reading. This means that low-level learners had less word-writing effects than high-level learners, even if they had been using word-writing primarily for their L2 vocabulary learning. This result supports Lee and Min's (2006) study that high-level learners use more vocabulary learning strategies and use them systematically than low-level learners. That is, low-level students may not know how to use a word-writing strategy more effectively, or another possibility is that the word-writing in CWL, not in an isolated way, in this study may help high-level students incorporate and promote their vocabulary knowledge.

Another interesting point from the survey is that students at low-level showed a more favorable attitude toward word-writing than students at high-level. The majority of low-level students answered that they preferred the word-writing strategy for their English vocabulary learning than meaning-inferencing (10 students of 14) and

thought word-writing was a more efficient strategy for English vocabulary learning than meaning-inferencing (11 students of 14). It can be seen that the learning outcomes do not depend on the participants' preference or their thoughts on the effectiveness of learning strategy. Their previous experience with the word-writing strategy seemed to create a more positive attitude toward word-writing than the meaning-inferencing strategy that they were less familiar with. Then, an important question for L2 teachers would be how we can make it work for them rather than discarding it as an outdated learning method.

## 5. Conclusion

The main purpose of the present study was to reexamine the effects of word-writing on CWL, with some modifications from previous studies (Candry, et al. 2017, Elgort, et al. 2016). In addition, to investigate the effects of word-writing from various angles, the effects of word-writing were analyzed depending on the type of tests and the level of participants.

The results of the study found that word-writing commonly used by Korean young learners appears to have a meaningful effect on L2 vocabulary learning. Therefore, word-writing should not be considered as an outdated vocabulary learning strategy, but rather should be encouraged for students to use it properly in a L2 classroom, irrespective of the learners' level, preference, perspectives of effectiveness, and previous L2 vocabulary learning strategies. Teachers can encourage students to write a novel word to generate strong motor memory. Moreover, it seems necessary to write the word with spaced learning sessions in order to expect a long-term retention of a word.

To be more specific, when presenting unfamiliar words in class, teachers can first tell students the meaning of words and show some sentences to demonstrate how the words are used by using Internet dictionaries and corpus sites such as COCA. After that, it is necessary to encourage students to write words as many times as possible, because the number of times a word is written seems to be a factor that greatly influences the effects of word-writing. It may be a good idea for teachers to set the minimum number of times students should write a word to make a stable motor trace in memory. Since the effects of word-writing have been found to work positively in CWL, being exposed to multiple sentence contexts will be good for learners.

Therefore, asking students to discover the sentences in which the target words are used as homework can be efficient, and then share them with each other in class.

Unfortunately, the findings of this study showed that word-writing did not have a long-term effect. However, this outcome confirms that it may be difficult to expect long-term memory after only one-time learning. Thus, the method to allow students to learn target vocabulary repeatedly with spacing is needed for a long-term effect of word-writing. For example, a second lesson can let students share sentences in which the target words are used and write the form of words in class. After a few days, asking the students to compose some sentences including the target words could be the third learning session. After the third learning session, it is expected that words will be remembered for a long time simply by mentioning the target words very briefly during the lesson. The significant point here is to offer many contexts for a target word to students and to make them write the form of the word.

The current study contributed to gaining a deeper understanding of word-writing techniques in CWL, but there are also some limitations that ask for further exploration. First, students were required to participate for more than one hour in the present study, so it was very difficult for many Korean high school students to participate. While the findings of this study were comparable with those of previous studies, a larger number of participants would be desirable for a more accurate comparison. Also, it is difficult to expect a long-term effect of word-writing in a one-word learning session. Thus, further study is necessary to examine which learning condition has a more positive effect on L2 vocabulary learning in the case of word-writing and meaning-inferencing during three or more learning sessions.

In addition, our findings seem to indicate that word-writing is beneficial to high-level learners, regardless of their previous L2 vocabulary learning experience, their preferred learning condition, and their thoughts about the efficiency of the learning condition. Therefore, further research is needed to determine whether this result was due to the ability of high-level learners to more effectively use vocabulary learning strategies. Also, it is necessary to find out how learner's cognitive or emotional factors affect the results of the study in future research.

Lastly, the interest in word-writing has been waning in recent years partly because electronic devices such as computers and smart-phones automatically correct spelling errors. There is a tendency to learn the spelling of a word through oral practice, rather than word-writing in a language classroom. Further research is needed to see whether oral practice brings similar effects to that of word-writing to learners.

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Examples in: English

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