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THE EFFECT OF RECEPTIVE AND PRODUCTIVE TASKS ON LEXICAL KNOWLEDGE DEVELOPMENT

By

Ji-Yoon Choi

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ABSTRACT

THE EFFECT OF RECEPTIVE AND PRODUCTIVE TASKS ON LEXICAL KNOWLEDGE DEVELOPMENT

By

Ji-Yoon Choi

This study investigated differential effects of receptive and productive tasks on lexical knowledge development. The task effects were explored through the intervening factors of learning contexts (EFL and ESL) and prior knowledge (no-knowledge and partial knowledge) about target words. Korean EFL and ESL students attempted to learn 24 nonsense target words through receptive (reading) or productive (writing) tasks under the same time condition. The task types, the levels of word knowledge, learning contexts, and time (before, immediately following, and a week after the treatment) served as the independent variables. The dependent variables were the scores of four types of tests including form (L2) recognition, concept (L1) recognition, receptive (L2 to L1) translation, and productive (L1 to L2) translation. The result showed that the reading task contributed more significantly to both receptive and productive lexical knowledge gains than the writing task in both contexts but the superior effect of the reading task diminished one week later due to the marked decay of the reading group's gains. The EFL students showed a wider gap between the tasks and better retention a week later than the ESL students. Concerning partial knowledge, the reading task revealed a superior effect for both unknown words and partially known words, and the gains and retentions were higher for the unknown words.

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Introduction

What does it mean to know a word in another language? Beginning with Richards' (1976) first attempt to list the different types of word knowledge (Schmitt & Meara, 1997), a substantial body of research has provided a range of lexical knowledge to define what it means to know a word, yet defining word knowledge is still an uncompleted task. Most researchers agree that knowing a word is not an all-or-nothing proposition (Laufer & Paribakht, 1998; Meara, 1996; Melka, 1997; Nation, 1990, 2001; Schmitt, Schmitt, & Clapham, 2001); there are many aspects of knowledge involved in knowing a word, which involves more than just the link between meaning and form (Laufer & Goldstein, 2004; Schmitt, 2000). However, consensus does not exist about the nature of word knowledge within scholarly works during the past decades. Moreover, word knowledge involves not only a multifaceted aspect but also a dynamic nature. Lexical knowledge grows incrementally within an individual second language (L2) learner. As early as 1953, Dolch and Leeds stressed the dynamic and complex nature of word knowledge pointing out that "meaning is a growth" (cited in Henriksen, 1999, p. 189). Given that word knowledge is incrementally growing or hierarchically developing with multifaceted aspects, defining what it means to know a word seems to be "a mammoth task" (Melka, 1997, p. 46) for language teachers, language testing designers and researchers in second language acquisition.

This study addresses the issue of knowing a word with a focus on receptive and productive knowledge. The two types of knowledge have been widely estimated but rarely defined (Melka, 1997) in related research. Even though there is a consensus among L2 researchers that there is a difference between vocabulary used for comprehension (i.e.,

receptive vocabulary) and vocabulary for production (i.e., productive vocabulary) (see Zareva, Schwanenflugel, & Nikolova, 2005), the distinction between receptive and productive knowledge is quite controversial (Laufer & Goldstein, 2004). This study aims to investigate what it means to know a word receptively and productively, and how L2 learners acquire the two types of knowledge. This inquiry is closely related with a pedagogical consideration about the effect of tasks that are typically implemented in L2 language classes. One essential question is how receptive and productive tasks differentially affect lexical knowledge development, and which conditions are more beneficial for helping learners to acquire vocabulary through classroom instruction. This study seeks an answer for these questions by comparing the effects of receptive and productive tasks which are typically implemented in L2 language classes.

Another issue addressed by this study is the effectiveness of tasks on incremental gains at the initial stage of learning. Given that word knowledge is a dynamic and growing entity, the levels of initial word knowledge might play a role on subsequent gains. That is, the effect of receptive and productive tasks may be dependent upon the degrees of initial knowledge about the target words. The present study operationalizes levels of word knowledge about nonsense target words (TWs) by controlling input in a priming phase. In addition, this study considered other possible factors in exploring the effects of tasks on lexical gains including different learning contexts (EFL vs. ESL) and vocabulary proficiency.

Although previous studies have administered receptive and productive tests in order to measure receptive and productive gains, only a limited number of studies have been devoted to the investigation of how the receptive and productive gains are affected

by receptive and productive learning. Within very limited numbers of related studies, the findings show sharply contradicting results about the effect of tasks on lexical gains. This study explores this contradiction in the effects of the tasks, and their contradictory findings are compared with each other with an additional focus on the methodological differences. Furthermore, no studies operationalize partial knowledge as an intervening factor in treatment studies, and little is known about how tasks contribute to the development of partial knowledge in L2 lexical acquisition. Given that knowledge is developed incrementally, it is important to examine how receptive and productive tasks contribute to incremental lexical development.

Various dimensions of lexical knowledge are explored with some theoretical issues in order to yield in-depth understanding about knowing a word. More specifically, receptive vs. productive word knowledge is examined through the concept of word knowledge as a continuum, and the incremental nature of L2 vocabulary is highlighted. Next, this study reviewed the previous studies that empirically investigated the effect of receptive and productive tasks on word knowledge development. Then, the relative strength of receptive and productive tasks for the levels of prior knowledge is compared.

This inquiry will provide empirical evidence for the differential effects of the tasks on vocabulary acquisition, and will help to resolve the conflicting results about the effects of tasks on lexical gains. Next, such investigation is able to determine how additional factors including vocabulary size, learning context, and level of word knowledge, intervene in the process. Finally, discovering how to capture partial lexical knowledge and investigating how partial knowledge develops into full knowledge is essential for in-depth understanding about the process of L2 vocabulary acquisition.

Review of Research

Dimensions of Word Knowledge

According to Zareva et al. (2005), three models of lexical knowledge have been proposed: a) a separate trait model, b) a global trait model, and c) receptive vs. productive dimension. The current study will focus on the receptive vs. productive dimension while exploring the concept of word knowledge.

Within the separate trait paradigm, lexical knowledge is divided into a set of descriptive criteria (Gass & Selinker, 2001; Nation, 1990, 2001). For example, Nation (2001) suggested four categories: form (spoken and written form), position (grammatical behavior and collocation patterns), function (word frequency and appropriateness), and meaning (conceptual content and word associations). Researchers challenged the descriptive criteria proposed in the separate trait model, because, even though it is theoretically possible to describe the distinct aspects of word knowledge, it is not clear in practice how to apply those separate traits to a test. It is hard to design a test measuring all of the traits for words based on the model (Zareva et al., 2005).

Second, in the global trait model, smaller numbers of measurable dimensions were proposed, which reflect the overall state of learners' vocabulary (Meara, 1996). This model allows researchers to examine the general condition of the L2 mental lexicon within two, three or four dimensions (Zareva et al., 2005). For example, some researchers have suggested the two aspects of ***breadth*** and ***depth*** (e.g., Read, 1993, 2000; Wesche & Paribakht, 1996), while others proposed three aspects including ***quantity***, ***quality*** and ***receptive-production control*** (e.g., Henriksen, 1999). Still others have proposed four aspects including quantity, quality, receptive-production control, and *lexical organization*

(Chapelle, 1998, cited in Zareva et al., 2005). Generally, the most important traits in global dimension include *breadth* (vocabulary size or quantity) and *depth* (quality of lexical knowledge such as pronunciation, orthography, morpho-syntactic, semantic features, register, collocations) (Zareva et al., 2005). Breadth (i.e., the number of words learners know) has been judged as a key dimension of lexical competence for a long time in previous studies, but recently depth has been emphasized because it includes awareness of the multidimensionality of word knowledge. However, there is no consensus on what constitutes or indicates depth. Therefore, it is difficult for researchers to examine learners' overall state of word knowledge through only the depth of word knowledge.

The third model for word knowledge with which the present study is concerned is a receptive and productive knowledge dimension. The basic concept for this distinction is between "knowledge used for perceiving the form of the word and retrieving its meanings," and "knowledge used for retrieving the appropriate spoken or written form of the meaning that we want to express" (Laufer & Goldstein, 2004, p. 404). Put simply, receptive knowledge is related to comprehension, whereas productive knowledge is concerned with production.

This seemingly clear and simple distinction is, however, quite controversial and not successfully defined (Laufer & Goldstein, 2004; Melka, 1997). Part of the problem comes from the different expressions used to describe the two notions, which has created methodological problems in comparing knowledge across previous studies (Laufer & Goldstein, 2004; Melka, 1997; Read, 2000). For example, Melka (1997) listed interchangeable terms as following: a) receptive vocabulary vs. productive vocabulary, b)

passive vocabulary vs. active vocabulary, c) comprehension vs. production, d) understanding vs. speaking, and e) recognitional vocabulary vs. actual and possible use.

Another controversial issue comes from different criteria for what it means to know a word receptively or productively. The distinction between both types of knowledge includes not only the different quality of the knowledge in the mental lexicon but also an ability that is ultimately judged by production. According to Henriksen and Haastrup (1998), the distinctions between the two types of knowledge have been made by the following three criteria: a) a difference between input /output modules and specifications; b) a difference between the type and extent of automaticity which has been developed; and c) a difference in the quality of meaning representation in the mental lexicon. In other words, the distinction between receptive and productive knowledge involves an ability to control the knowledge as well as the different qualities and modules. In addition, the receptive and productive dimension were identified as "a bridging dimension between lexical competence and performance" (Zareva et al., 2005, p. 570) or as a combined notion referring to both ability and general lexicon (Melka, 1997).

In terms of the development of productive and receptive knowledge, research has considered learning order, size, distance, and growth rate. First, receptive vocabularies are generally assumed to be acquired before productive vocabularies (Aitchison, 1994; Channell, 1988; Laufer, 1998; Melka, 1997). Second, regarding size, most studies assume that passive (i.e., receptive) vocabulary is larger than active (i.e., productive) (Laufer, 1998; Laufer & Paribakht, 1998). Some studies reported that L2 receptive vocabularies are double that of L2 productive vocabularies (Eringa, 1974, cited in Melka, 1997). However, there is counterevidence for these differences, which indicates that the gap

between the two knowledge dimensions is not as noticeable as originally produced (e.g., Annen, 1933; Seashore & Eckerson, 1940; Takala, 1984, cited in Melka, 1997). Third, with regard to distance, a study reported the gap between the two types of knowledge became wider at a higher level of language proficiency, and some factors including learning context and proficiency affected the distance between the two types of knowledge (Laufer & Paribakht, 1998). Laufer and Paribakht showed that the gap between receptive and productive vocabulary size was smaller in EFL participants than the gap in ESL participants and the gap became greater as passive vocabulary knowledge increased (i.e., with higher proficiency). They concluded that passive vocabulary is changed into active at a different rate and amount, depending upon the learning context (EFL or ESL), the total vocabulary size of a learner, and the frequency level within a learner's lexicon. In addition, many studies agree that receptive and productive knowledge develop at different rates, as learners proceed in their L2 learning in which the productive knowledge usually grows at a slower rate than receptive knowledge (Laufer, 1998; Laufer & Paribakht, 1998).

Receptive vs. Productive Knowledge as a Continuum

The distinction between productive and receptive knowledge, however, does not imply that the two different types of knowledge exist as a dichotomous entity in a learner's mental lexicon. The dichotomy of receptive and productive knowledge can mislead researchers as if learners possess two distinct vocabularies in the mental lexicon. However, the distinction between the two types of knowledge can only be acceptable for reasons of convenience (Melka, 1997). Even though some studies have suggested qualitative differences between passive and active vocabulary items (Clark, 1993; Meara,

1990), recent studies generally accept that vocabulary acquisition occurs along a continuum of development (Henriksen, 1997; Melka, 1997). In the continuum approach, the distance between receptive and productive knowledge is visualized as a line (Melka, 1997) where a word passes over a threshold from receptive into productive use (Henriksen, 1999; Melka, 1997; Nation, 1990; Read, 2000; Waring, 2002). For example, Laufer (1998) postulated that the learning of a word usually progresses from receptive to productive knowledge. Similarly, Henriksen (1999) suggests, "most lexical items initially enter the learner's receptive vocabulary and may only subsequently become available for productive purposes" (p. 313).

However, the concept of continuum does not necessarily assume that receptive knowledge automatically predicts its production (Henriksen, 1999; Laufer & Paribakht, 1998; Melka, 1997). For example, Henriksen (1999) suggests that only a limited number of words that we know receptively will ever become productive. However, it is not clear how much knowledge is necessary for a word to move from receptive to productive status (Laufer & Goldstein, 2004) or what the prerequisite is for changing words from receptive to productive use in a learner's lexical knowledge. Melka (1997) suggests that word familiarity distinguishes where a word will be on the receptive and productive continuum. Similarly, word frequency (Laufer & Paribakht, 1998), automaticity (Meara, 1996), or control ability (Henriksen, 1996, 1999) is identified as indicators of change from the receptive to productive domain.

Furthermore, the concept of continuum does not necessarily mean that vocabulary development is always linear. In fact, a few studies argued against the linear view of lexical development. According to Waring (2002), the linear view in the continuum

approach presupposes that one's vocabulary must be complete before any aspect of production can proceed, so this view cannot explain why it is possible for learners to use a word well without understanding all aspects of its meaning. Henriksen (1999) notes the multidimensionality of lexical development; "there is considerable variability in the learning process, with each lexical item going through the stages at different times and at varying speeds" (p. 310).

In order to account for the multidimensionality of the lexical growth, two or three-dimensional continua have been proposed. Henriksen (1996, 1999), devised a model of vocabulary acquisition based on a three dimensional continuum. Figure 1 illustrates shows how different word knowledge develops along three continua.

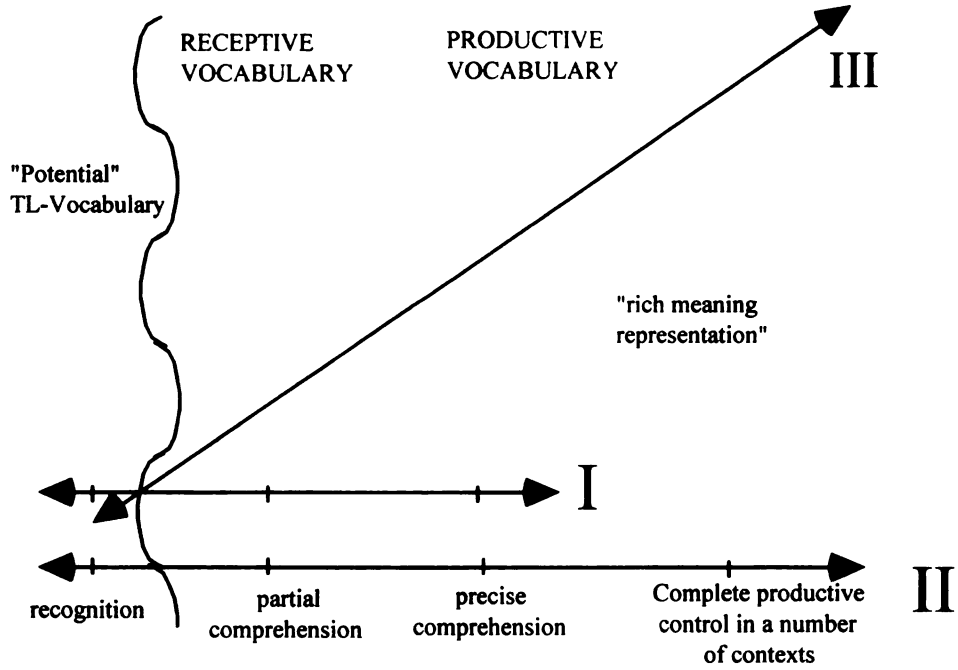

Figure 1. Henriksen's (1996) model of vocabulary acquisition (cited from Waring, 2002).

In this model, word knowledge develops along a continuum with three different dimensions: a) partial to precise knowledge, b) depth of knowledge, and c) receptive to productive use ability. The partial to precise knowledge continuum and depth of knowledge continuum are a process where levels of declarative word knowledge may be operationalized as different levels of understanding or comprehension. The receptive to productive continuum is "a control continuum that describes levels of access or use ability, which may be operationalized through different types of receptive and productive tasks" (Henriksen, 1999, p. 314). The process of partial to precise knowledge is associated with the "mapping process (i.e., creating extensional links via both labeling and packaging) while depth of knowledge is associated with "network building (i.e., creating intentional links)" (Henriksen, 1999, p. 312). The receptive to productive continuum concerns a learner's ability, control, or access. Thus, in this three-dimensional continuum, receptive knowledge moves toward complete control in production by reorganizing or restructuring the lexicon while knowledge develops in hierarchical order (i.e., knowledge moves from initial word recognition to mastery of meaning along both the partial to precise and the depth continuum).

In summary, lexical knowledge can be defined as the sum of interrelated "subknowledges" or a continuum consisting of several levels of knowledge (Laufer & Goldstein, 2004). A set of descriptive criteria is used for a separate trait model, or a few dimensions such as breadth and depth are suggested in the global trait models. The receptive and productive domain can be understood as a continuum with several levels of knowledge, which includes both knowledge and ability to use the knowledge. In the continuum, receptive knowledge is assumed to be acquired earlier than productive

knowledge, and develops into productive knowledge incrementally. However, this does not necessarily mean that the development of knowledge is linear.

This current study defines receptive knowledge as the knowledge needed to understand the meaning of the L2 word and productive knowledge as knowledge needed to retrieve the form of L2 word. The knowledge related to depth (within a global trait model.) is not included because the focus of this study is placed on the initial form-meaning mapping stage, which starts with a vague familiarity with the word form and progresses into a certain degree of receptive and productive knowledge on a continuum. Therefore, receptive knowledge will be limited only to a meaning of a target word, and productive knowledge, to an ability to use the word correctly. Other abilities, such as an ability to use the word correctly in free production are beyond the scope of this study.

Receptive vs. Productive Tasks

The distinction between receptive and productive tasks comes from receptive knowledge or productive knowledge that the tasks are intended to generate. In general, receptive tasks include reading, looking up words in a dictionary, matching words with their meanings or definitions, guessing from context, and learning from word pairs. Productive tasks refer to cloze exercises, writing tasks, oral interview tasks, picture-description tasks, retell tasks, and translation exercises (Nation, 2001; Schmitt, 2000). However, as there is no consensus about the definition of receptive and productive knowledge, there is no general agreement on the effects of these tasks on lexical knowledge development. The controversial effects of tasks become more complex when we consider the relationship between task types and knowledge gained as a result of the tasks. That is, there is no conclusive answer for the question "Which type of tasks is more

beneficial for gaining receptive or productive knowledge, or even both?" Despite general disagreement on the effects of tasks for lexical development, there is only a limited body of empirical research that compares the efficiency of receptive and productive tasks. The following section reviews the empirical studies published to date.

Studies addressing the effectiveness of tasks.

A very limited number of studies have been devoted to empirical investigations of the task effects except for research on word pairs. Recently there have been a few studies concerning receptive vs. productive tasks, but the findings from these studies demonstrate contradicting results about task effects.

The word pair studies refer to research concerning the effect of presentation orders of L2 words on vocabulary retention. Mondria and Wiersma (2004) listed the studies that compared receptive learning vs. productive learning so far (e.g., Griffin & Harley, 1996; Schneider, Healy, & Bourne, 2002; Stoddard, 1929; Waring, 1997). Generally, participants in these studies were given a word card with an order, L1 to L2 or L2 to L1, and then were tested productively (L1 to L2) and receptively (L2 to L1). The word pair studies note that the type of learning affects the type and amount of knowledge gained and retained. These studies consistently conclude that words learned receptively show greater gains on receptive measures, while the words learned productively have larger gains in productive measures and initial learning difficulty in productive learning led to better long-term retention. The findings related to receptive vs. productive dimensions were:

1) Equivalence of type of learning and type of tests yielded better results than non-equivalence of learning and testing (i.e., L2 to L1 order is beneficial for L2 to L1 tests

while L1 to L2 order is beneficial for L1 to L2 tests) (Griffin & Harley, 1996; Stoddard, 1929; Waring, 1997).

2) L2 to L1 (receptive learning) yielded a sizable amount of productive knowledge and L1 to L2 (productive learning) yielded a substantial amount of receptive knowledge (Griffin & Harley, 1996; Stoddard, 1929; Waring, 1997).

3) Scores on receptive tests were significantly higher than those on productive tests (Griffin & Harley, 1996; Stoddard, 1929; Waring, 1997).

Despite these consistent results about the effects of learning types, the effect for retention loss or decay was not equivocal among the studies. In a study comparing the two types of word order with English high school students learning French, Griffin and Harley (1996) suggested that total retention as a result of L2 to L1 (receptive) learning decayed at a comparable rate to the total retention as a result of L1 to L2 (productive) learning. However, receptively learned words decayed more than productively learned words between immediate and delayed tests in another study (Schneider et al., 2002). In a study investigating receptive and productive vocabulary learning from word cards with 60 Japanese university students who were studying English as their major, Waring (1997) reported that productive knowledge decayed faster than receptive knowledge regardless of learning types.

In addition to the effect of equivalence of task type and learning, the word pair studies also suggest that productive tasks may be more effective if only one type of task is used because productive tasks are more difficult than receptive tasks, which leads to better retention (Griffin & Harley, 1996).

More recently, Mondria and Wiersma (2004) compared learning words both

receptively and productively against learning words only receptively or productively with 198 Dutch pupils learning French at pre-university levels. The receptive vs. productive tasks referred to word presentation order, which is similar to the word-pair studies mentioned above. In their study, the participants were presented with sixteen French words in one of three conditions: receptive only condition (L2 to L1 order), productive only condition (L1 to L2 order), and combination condition (L2 to L1 order + L1 to L2 order). Results of the study showed that the combination led to a similar level of receptive retention as the receptive only condition and a comparable level of the productive retention to productive only condition. In addition, this study suggested that "productive learning is a more versatile direction for learning when both production and comprehension are required" (Mondria & Wiersma, 2004, p. 453) because the initial difficulty of learning in writing is beneficial for the productive test, which is a more demanding type of tests.

Similarly, the positive effect for productive tasks has been repeatedly reported from studies that explored information processing induced by the task (Hulstijn & Trompetter, 1998; Hulstijn & Laufer, 2001). Even though those studies did not focus on the receptive and productive knowledge dimension, they compared two types of text processing (reading and writing) in their experiments (Hulstijn, 1993; Hulstijn & Trompetter, 1998; Laufer & Hulstijn, 1998; Hustijn & Laufer, 2001). These studies suggested that words used in productive tasks were retained more than words practiced in nonproductive tasks. For instance, Hulstijn and Laufer (2001) compared three types of learning tasks: reading comprehension with marginal glosses, comprehension plus filling in target words, and writing composition with target words. The study intended to test the effect of *the*

Involvement Loads with various combinations of need, search, and evaluation by measuring short-and long-term retention of ten unfamiliar words from the three learning tasks.[1] The results showed that the highest retention in the composition groups and the lowest in the reading group. The study concluded that writing was more conducive to incidental vocabulary learning than reading because of the higher involvement load. In other words, productive tasks (writing) led to greater elaboration when processing the new information.

Contrary to the studies showing the positive effect of productive tasks, there have been a few studies suggesting a negative effect of production on vocabulary instruction (Barcroft, 2002, 2004b). These studies were based on the cognitive perspective of *Lexical Input Processing* which focuses on word-level input processing. Barcroft (2004b) explored how learners allocate limited processing resources to different aspects of the vocabulary learning process, including form, meaning, and form-meaning mapping. This study investigated the effects of semantic elaboration on word form acquisition by comparing two task types, a writing and a no-writing tasks. In Experiment 1, the participants wrote the new word in a sentence after viewing one repetition of each L2 word for 48 seconds in the sentence writing condition, and viewed four repetitions of each word for 6 seconds (24 seconds in total) in the no-sentence writing condition. In Experiment 2, both groups viewed only one repetition for 24 seconds. The gains were measured by a productive test (form writing). The result revealed that the performance of the writing group was not comparable to that of the non-writing group in both experiments. This study concluded that L2 word learning could be hampered by

[1]The concept of "involvement load" hypothesized that the degree of involvement by "need" (motivational component), "search", and "evaluation" (cognitive component), can predict the success of retention while assuming that different tasks generate different involvement load.

excessive focus on word meaning during the writing task. That is, semantic elaboration and forced output in writing can hamper word form learning at an initial stage.

Interestingly, Barcroft (2004b) suggested writing tasks could facilitate the acquisition of known word. The effect of semantic elaboration involved in writing tasks depends on "whether the to-be-remembered word in question is a known word or a new word" (p. 306); "although semantic elaboration can facilitate memory for known words, it may not facilitate and can even inhibit memory for new word form" (p. 325). According to another of his studies examining the effect of semantic and structural elaboration on L2 lexical acquisition (Barcroft, 2002), the semantic elaboration condition facilitated performance on free recall of known words in a previously acquired language, but inhibited performance of free recall of new words. This study examined the effects of semantic vs. structural elaboration on L2 lexical acquisition with English-speaking low-intermediate L2 Spanish learners. There were three conditions in learning 24 new Spanish words: + semantic, + structural, and no elaboration. The results, which were measured by free recall of the target words in L1, free recall of the target words in L2, and cued recall (picture to L2), showed that better L2 free recall for + structural than + semantic, higher L1 free recall for + semantic than + structural, and higher overcall recall for no elaboration than +structural and + semantic condition. In other words, semantic elaboration involved in the writing task resulted in better scores in L1 free recall tests, whereas structural elaboration led to better scores in L2 free recall tests. Barcroft interpreted the results as evidence for the effect of writing tasks on known words as opposed to unknown words, and suggested that increased semantic processing might facilitate the ability to remember the known words. This finding implies that the

productive task's effects might depend on how much learners know about the words *a priori*.

In a different study, Webb (2005) reported a similar negative effect of writing tasks on the acquisition of new words. In the study investigating the effects of receptive and productive tasks on lexical gains, the participants were asked to read three glossed sentences (receptive task) or to write a sentence (productive task) for each target word. Similar to Barcroft (2004b), Webb conducted two experiments with different time conditions: same time for each task, and more time for the writing task. This study measured five aspects of vocabulary knowledge (orthography, syntax, association, grammatical functions, and meaning and form) by receptive and productive tests. The results showed that the receptive task group outperformed the productive task group on both receptive and productive measures when the same amount of time was spent. However, the writing group performed better in both receptive and productive tests than the reading group when more time was given. In Webb (2005), the reading group's better performance in both receptive and productive measures under the same time condition was contradictory to the hypothesis proposed in this study. This study had hypothesized that receptive learning is conducive to receptive knowledge whereas productive learning leads to larger gains in productive knowledge, but the results did not support the hypothesis. Webb explained the reading group's out-performance in terms of extra time for the reading group. That is, the reading group could process the input deeply because reading usually takes less time than writing. In addition, this study interpreted the contradictory results between different time-condition as evidence for the strong effect of writing because the second condition (more time for writing) represented an authentic

learning situation, where writing usually requires more time than reading. Even though this study argued for productive learning tasks over receptive tasks, however, it should be noted that the writing group's smaller gain measured by both receptive and productive tests is consistent with the negative effect for productive tasks in Barcroft (2004b).

In summary, there is little consensus on the effect of receptive and productive tasks on receptive and productive knowledge gains. Equivalence of task and test types were reported from word pair studies, suggesting that receptive tasks are more effective for receptive gains while productive tasks are better for productive gains. Moreover, these studies recommended productive learning as the better all-purpose way to learn because of the relative strength of the Ll to L2 order for retention. More beneficial effects of productive tasks were reported by other studies as well. These studies were concerned with the "involvement load" of tasks and reported the strong effects of writing tasks because writing tasks usually involved more mental elaboration. In contrast, a negative effect from productive tasks was suggested from a few recent studies. These studies claimed that writing might hamper the learning of the word forms because of the additional allocation of memory to semantic elaboration at the initial stage of form and meaning mapping.

Methodological Issues from Previous Studies

The puzzling differences from the previous studies regarding the effects of receptive and productive tasks raise methodological issues concerning factors affecting those results. Even though much research has acknowledged that "it is something of a truism in experimental psychology that relatively slight changes in participants, tasks, and materials can results in variation in data" (Griffin & Harley, 1996, p. 443), a

consideration of the methods should be preceded by an interpretation of the findings from previous studies, reflecting on some methodological differences among them. The methodology used in previous studies revealed a wide range of factors that affected the results and interpretations: a) task types b) time for completing tasks, c) test types, d) test repetition (i.e., the type, order, time, number and span of delayed tests), e) scoring method, f) participants pools (experience, age, proficiency), and g) target words (the type and number). Table 1 illustrates the differences in previous studies.

Task types & time.

First, the nature of receptive tasks must be considered in terms of the presence or absence of a context. Receptive tasks in the studies refer to either seeing a decontextualized word pair (e.g., L2 to L1 order word pair studies) or reading sentences (e.g., Webb, 2005). The results from the visual presentation of a word in the word pair studies must be distinguished from reading sentences in terms of the receptive task effect. Considering that a typical task in foreign or second language class is reading, generalizing the findings from word pair studies to receptive vs. productive task effect may be questionable. Moreover, given that learners acquire words from reading for meaning in content-based language classes, it seems necessary to explore the task effects based on meaningful context, which also reflects an authentic communication.

Next, the comparability of the tasks in the studies should be considered in terms of difficulty or task demand. For example, writing tasks ranged from copying words to writing sentences to composing original sentences; reading tasks ranged from viewing words with picture cues to reading sentences or texts followed by comprehension questions. Considering the different cognitive demands involved in those tasks, (i.e.,

Table 1

Summary Chart of Previous Studies Concerning the Effect of Receptive and Productive Tasks

		Treatments	Subjects	Target Words	Tests	Results
1	Griffin & Harley (1996)	R(L1-L2) order vs. P(L2-L1 order) in word pairs Between + Within subjects Time: 8 min.	FL (French), L1= English *N*= 110 11-13 yrs First year of learning	Unfamiliar words French word (*N*= 20) (N, V, Others)	Between subject R (L2 to L1), P (L1 to L2) translation 3 delayed test (+3 days, +7days, +28 days)	R-test was very higher R is good for R-test while P is good for P test R=P in overall retention P is desirable for all purpose direction
2	Waring (1997)	R(L1-L2) order vs. P(L2-L1 order) in word pairs Within subjects Time: 38 sec/ W for R, 48 sec/word for P	FL (English.), L1=Japanese *N*=70 University level, English major	Infrequent words (*N*= 30) (N. V. A)	P + R 4 post test R(+1 day, +1 week, +3 months)	R for R-test and P for P test P knowledge decayed faster
3	Mondria & Wiersma (2004)	R (L2 to L1) vs. R (L2 to L1) + P(L1 to L2) Between subjects Time: 15 min.	FL (French), L1= Dutch *N*= 198 14-16 yrs 3 Years of lessons	Unfamiliar words (*N*=16) (8N + 8V)	R (L2 to L1 translation) + P (L2 recall) Delayed test (+ 2 week)	No difference between R + P and R only in R retention No difference between R + P and R only in R retention P is good for P retention

Table 1 *(Cont'd)*

4		R1[a] (reading + comprehension question) R2[b](reading + comprehension question + filling in task) P (writing a composition) Between subjects Time: R1(40-45 min.), R2 (50-55 min.), P(70-80 min.)	FL (English) L1= Israel (*N*=97), Netherlands (*N*= 128) Advanced university learners	Unfamiliar words (*N*= 10)	R (recall in L1 or explanation in L2) Delayed test (+1 week)	P > R2>R1
5	Barcroft (2004)	R(words with pictures) vs. P(sentence writing) Within subject Time: 1st: P>R (48 vs. 24 sec/W), 2nd: P= R (24 sec/W)	FL (Spanish) L1= English 1st (*N*=44), 2nd (*N*=10) University level No advanced knowledge about Spanish	Nonsense words(concrete N) (*N*= 24)	P (L2 recall from pictures) 2 delayed test: (+2 days/ +1 week) Syllable vs. words scoring[c]	1st:P< R in R & P tests 2nd:P< R in R & P tests
6	Webb (2005)	R (reading in glossed sentences) P (sentence writing) Between subjects Time:1st : P= R (12 min), 2nd : P>R	FL (English) L1=Japanese * 1 (*N*=66)/ * 2 (*N*=49) University level First year of EFL	Nonsense words (*N*=10) (4 V + 6 N)	R (multiple choice), P (recall from cues) R & P for 5 dimensions No delayed test	1st:P < R in R & P tests 2nd: P> R in R. & P tests

Note. R = Receptive tasks; P = Productive tasks. N = Noun;V = Verb, A = Adjective. W = Words.

[a]Receptive task 1. [b]Receptive task 2.[c]The data was scored based on (1) syllable scoring, or the number of syllables correctly produced for the target words and (2) whole word scoring, or 1 point for each correctly produced word

viewing words is much easier than reading sentences, and reading simple sentences is easier than reading paragraphs accompanying comprehension questions), it is important to adjust the task demands to be comparable. Moreover, a task representing receptive or productive learning can be a combination of both of the learning types. The interpretation requires consideration of the task demand in those tasks.

Time on tasks is an important factor in interpreting the results. Most studies allotted the same amount of time for each treatment: 6 minutes / 20 words (e.g., Griffin & Harley, 1996), 48 sec/ w (N= 30) (e.g., Waring, 1997), 15 minutes / 16 words (e.g., Mondria & Wiersma, 2004). However, two studies (Barcroft, 2004b; Webb, 2005) provided more time for writing in one of the conditions. Even though time can be considered as an inherent property of a task (Hulstijn & Laufer, 2001; Webb, 2005), it is not clear how much time should be given to the experimental writing tasks to reflect authentic learning. Moreover reading tasks can also be time consuming, especially at lower levels of proficiency. Thus, as a first trial to compare the two types of tasks, this current study provided the same time to each condition.

Test methods & time.

The next consideration is the method of assessing the acquired knowledge. In particular, productive tests showed a wide range of types including L1 to L2 translation (Griffin & Harley, 1996), L2 recall (production) to picture cues (Barcroft, 2004b), and L2 recall to L1 cues in both multiple choice and translation formats (Webb, 2005). The different degrees of difficulty might affect participants' performance on these tests. In addition, Webb (2005) measured ten aspects of knowledge: receptive and productive knowledge with five separate traits (orthography, syntax, association, grammatical

functions, and meaning and form). These tests are more likely to be overlapped, thus contributing to the subsequent tests, even though all productive tests were completed before receptive tests to avoid a learning effect. Moreover, the ten types of tests are more likely to result in a learning effect in addition to possible learner fatigue.

More importantly, the number of delayed tests and the intervals between tests must be considered because these repeated tests potentially yield additional learning effects. For example, Griffin and Harley (1996) conducted three delayed tests (three days, seven days and twenty-eight days after the immediate test) and Waring (1997) provided one day, one week, and three months after the immediate posttest. The repeated exposure to the words through the delayed tests might interact with the receptive and productive tasks in the knowledge gains.

Scoring should be considered as well when the results are interpreted. Scoring of the productive test was not reliable in Griffins & Harley's (1996) study, which measured "identifiable approximation" for a production test. In addition, there was no mention about partial scores in production tests (e.g., L1 recall or L2 recall) except in Barcroft (2004b). In his study, the data were scored in two ways; one based on syllable scoring which awarded scores to the number of syllables correctly produced, and the other based on whole word scoring which awarded one point for each correctly produced word. If the test measures production of the participants, the test should be sensitive to partial gains (Waring, 1997) because an ability to produce is not a yes/no phenomenon, but involves degrees of knowledge (Laufer & Nation, 1999).

Target words.

The results might be affected by the nature of target words themselves. The

targeted words in the previous studies were either unfamiliar (Griffin & Harley, 1996; Mondria & Wiersma, 2004), infrequent real words (Waring, 1997) or nonsense words (Barcroft, 2004b; Webb, 2005). The real words that were unfamiliar or infrequent raise the issues of additional learning effect besides the treatment, and different degrees of knowledge about the words (i.e., participants' different degrees of familiarity with the forms). Even though the studies using real words conducted a pre-test to measure the familiarity with the words, the tests were based on self-reporting in which validation was impossible. Moreover, it is plausible for learners to have some degree of partial knowledge about the words even though they thought that they did not know the words when they learn a familiar language. For example, Mondria and Wiersma (2004) pointed out subjects' familiarity with L2 orthography may affect the results in Stoddard's (1929) study, which used subjects who had no experience in learning the L2.

In summary, the sharp contradiction about the effect of tasks in the previous findings may be due to the different methodologies used in the studies. The current study considers these differences in designing an experiment in terms of comparability in receptive and productive tasks, measurements, time, and target words. Based on this consideration, the present study aims to find empirical evidence for the differential effects of receptive and productive tasks on lexical knowledge development, and to determine how additional factors intervene in the process. These factors included vocabulary size, learning context, and level of word knowledge. Such investigation attempts to answer the following question, "Which task type is more beneficial for promoting word knowledge and at which point?"

Research Questions

The following research questions guided the present study:

1. Do receptive (reading) and productive (writing) tasks contribute differentially to productive and receptive knowledge gains?

2. If so, do receptive (reading) tasks result in better gains and retention than productive (writing) tasks for unknown words vs. partially known words?

3. If so, do productive, writing tasks result in better gains and retention than writing tasks for partially known words vs. unknown words?

4. Are the differential effects of reading and writing tasks dependent on the learning context, ESL vs. EFL?

Based on recent findings by Barcroft (2002, 2004b) and Webb (2005), it was hypothesized that receptive (reading) tasks and productive (writing) tasks would differentially affect lexical knowledge development. Reading tasks were expected to be more beneficial than writing tasks on gaining both receptive and productive knowledge at the initial stage of form-meaning mapping. In addition, these effects were expected to be maintained after one week. However, based on Barcroft's (2002) prediction, the differential effect of both tasks was also expected to be dependent on the level of prior knowledge of the target words. If the target words are totally unknown to L2 learners, the writing tasks might not be more beneficial to prompting subsequent gains due to the harmful effect of semantic elaboration involved in the writing tasks. However, if the words are partially known to L2 learners, the writing tasks may have beneficial effect on improving lexical knowledge. Moreover, if writing tasks lead to deeper processing than reading tasks, as suggested in the previous studies (e.g., the word pair studies and the

studies related to the involvement load hypothesis), writing tasks may lead to stronger retention over time compared to reading tasks.

In order to obtain a more generalizable conclusion, this study included data from different learning contexts, EFL in the U.S. and ESL in Korea. Laufer and Paribakht (1998) suggested that the different learning contexts lead to a different amount of lexical knowledge development at a different rate because EFL students have more limited opportunities for exposure to input and practice with the L2 compared to ESL students. Based upon their findings, the differential effects of reading and writing tasks are expected to be dependent on learning contexts.

Methods

Participants

The participants in this experiment were 35 Korean EFL students and 36 Korean ESL students. Both EFL and ESL students were studying English at an intermediate level at the time of this study. The EFL students were enrolled in Winter English courses in Jeonbuk National University in Korea and the ESL students were enrolled in English courses at MSU. Their ages ranged between 19-32 years, and the overall ratio between female and male was 42.3 %: 57.7 %. Table 2 describes biographical data of the participants. The overall mean length of residence in English-speaking countries was less than twenty-four months. The two groups were comparable in terms of age distribution. However, there were more males than females in the EFL context while the opposite was the case in the ESL context. In addition, the EFL students had less experience with studying in an English-speaking country than the ESL students.

The EFL data were collected in Korea by the participants' English instructor, a professor of the English Department of Jeonbuk National University in Korea, via a verbal announcement in their English classes and then, by the researcher via e-mail. The ESL data were collected in the U.S. by the researcher. The ESL subjects at MSU were contacted by the researcher through a verbal and written announcement in their ESL classes.

Materials

Baseline Indicators of proficiency.

Participants' proficiency was measured by the Vocabulary Levels Tests (Laufer & Nation, 1999; Schmitt, 2000). This measure was chosen since the focus of this study is the

Table 2

Biographical Data of the Participants

		Gender		Age		LOR[a] (month)	
				M	*SD*	*M*	*SD*
Reading	EFL	Female	(*n* = 5)	23.00	1.87	1.00	1.73
		Male	(*n* = 13)	25.54	1.71	0.00	0.00
		Total	(*n* = 18)	24.83	2.07	0.28	0.96
	ESL	Female	(*n* =11)	23.36	3.11	14.91	16.91
		Male	(*n* = 7)	23.29	2.14	16.86	15.81
		Total	(*n* = 18)	23.33	2.70	15.67	16.04
	Total	Female	(*n* = 16)	23.25	2.72	10.56	15.35
		Male	(*n* = 20)	24.75	2.12	5.90	12.12
		Total	(*n* = 36)	24.08	2.49	7.97	13.65
Writing	EFL	Female	(*n* = 3)	21.33	2.08	0.00	0.00
		Male	(*n* = 14)	25.14	2.32	1.86	4.74
		Total	(*n* = 17)	24.47	2.67	1.53	4.33
	ESL	Female	(*n* = 11)	23.73	4.05	16.64	18.19
		Male	(*n* = 7)	24.00	2.77	6.29	5.71
		Total	(*n* = 18)	23.83	3.52	12.61	15.27
	Total	Female	(*n* = 14)	23.21	3.79	13.07	17.46
		Male	(*n* = 21)	24.76	2.47	3.33	5.38
		Total	(*n* = 35)	24.14	3.11	7.23	12.53
Total	EFL	Female	(*n* = 8)	22.38	2.00	0.63	1.41
		Male	(*n* = 27)	25.33	2.02	0.96	3.48
		Total	(*n* = 35)	24.66	2.35	0.89	3.11
	ESL	Female	(*n* = 22)	23.55	3.53	15.77	17.16
		Male	(*n* = 14)	23.64	2.41	11.57	12.67
		Total	(*n* = 36)	23.58	3.10	14.14	15.51
	Total	Female	(*n* = 30)	23.23	3.20	11.73	16.13
		Male	(*n* = 41)	24.76	2.28	4.59	9.27
		Total	(*N* = 71)	24.11	2.79	7.61	13.02

Note. [a]LOR refers to the length of residence measured by month in an English-speaking country.

acquisition of vocabulary knowledge.

The tests used in the current study consisted of receptive and productive parts. Each part (receptive and productive) includes five sections based on frequency levels to provide a profile of a learner's vocabulary instead of a single-figure estimate of overall vocabulary size (Schmitt et al., 2001). Previous studies have shown that the receptive Vocabulary Levels Tests is highly correlated with general proficiency (Laufer & Nation, 1999), and the productive Vocabulary Levels with the TOEFL test (Schmitt et al., 2001). Based on these findings, it was assumed that the Vocabulary Levels Tests gave an estimate of both general vocabulary size and the size at specific levels of L2 learners (Schmitt et al., 2001).

According to previous studies, knowledge of the most frequent 2,000 words in English represents the lexical items required for basic everyday oral communication (Schmitt et al., 2001). The next 1,000 words at the 3,000 word level indicate additional resources for spoken discourse and the threshold to read authentic texts. Knowledge of the most frequent 5,000 level words reflects enough lexical items for reading authentic texts, and learners with knowledge of the most frequent 10,000 words can be considered to have sufficient vocabulary to cope with the challenges of university study in L2. In addition to the four frequency levels, the fifth level, which estimates academic vocabulary, reflects the vocabulary required to engage in an English-medium academic environment.

The receptive vocabulary of the participants was assessed by Version 1 of the Vocabulary Levels Test (Schmitt, 2000) and productive knowledge by Version C of the Vocabulary Levels Test (Laufer & Nation, 1999). There have been different versions for

the receptive and productive Vocabulary Levels Tests: Version 1 and 2 for receptive tests and Versions A, B, C, and D for productive tests. Versions 1 and 2 were created by combining earlier receptive tests, Versions A, B, C and D. In the current study, Version 1 of the receptive tests and Version C of the productive tests were used because the words in Version 1, which was created by combining Version A and B (earlier versions of receptive tests), are more likely to overlap with those in Version A and B (productive versions). Administering different versions ensured the same items did not reappear on subsequent tests (Laufer, 1998). In addition, these versions were same to the versions used in Webb (2005) in order to make the proficiency of participants comparable to the study.

Version 1 of Vocabulary Levels Test measured the size of the words whose most frequent meaning learners understand in a multiple-choice format without context. There were 10 clusters in each section consisted of five frequency levels. Each cluster had six words and three definitions, and the participants were asked to match each definition with the correct word from the six choices. The test had 150 items (10 questions including three items for the five levels, 3 x 10 x 5). Version C of the Vocabulary Levels Test is a cued recall test within a sentence measuring the number of productive words that learners can use in a required context. Each question provided the first few letters of the target words in order to eliminate other possibilities (see, Schmitt et al, 2001). This controlled productive knowledge test consisted of five frequency levels, and had 90items (18 in each level). In the current study, the productive test preceded the receptive tests, and each test took approximately 30 minutes even though the participants were given as much time as needed. The scores of the tests were used as the baseline to equalize the different groups

compared in the experiment.

Target words.

The target words (TWs) were twenty-four nonsense words. The nonsense words eliminated the effect of the different degrees of prior knowledge about the target words, and ensured that there was no additional learning for the target words after the treatment. More importantly, the nonsense words made it possible to operationalize partial knowledge about the target words, with which the current study aims to find the relationship between prior knowledge and the task types in vocabulary learning.

Most of the words were drawn from previous studies (Pulido, 2000, 2003; Webb, 2005) with some modifications. In addition, some words were created for the purpose of the current study. There were 18 nouns and 6 verbs (see Appendix A). All the words maintained the orthographical and morphological rules of English, and kept the consistent morpho-syntactic form, noun as a singular form and verb as an infinitive form. In addition, all the words were of two syllables, and the number of letters was equalized, ranging from five to seven in order to make it comparable to Webb (2005)'s study which had two syllable words with five to six letters each.

The TWs were chosen on the basis of frequently mentioned concepts contained in three passages used in previous studies (Pulido, 2000, 2003). Then, these words replaced the real English words chosen from three passages representing a familiar topic for these participants. The three passages were elicited from two studies investigating the effect of topic familiarity in incidental vocabulary acquisition during reading (Pulido, 2003, 2004). The passages are *Dave's Adventures on Registration Day* for Passage 1, *The Trip to the Supermarket* for Passage 2, and *Doctor's Appointment* for Passage 3. These passages

were considered equally easy for the participants to understand in terms of topic familiarity and structure of the sentences. The passages were based on scenarios considered to be routine and very familiar to participants and were "loosely centered on a script purported to be stored in participant's long term memory" (Pulido, 2004, p. 481) by conforming to a temporally ordered set of activities relevant to the scenarios at hand. The same degree of familiarity with the topics in the three passages offset the possible effect of different topic familiarity on lexical inferencing and gains (see Pulido, 2003, 2004). Thus, each passage included eight target words whose concepts were thematically related within a story that had the same degree of topic familiarity (see Appendix B1 and C1). Structural descriptions of the passages are outlined below.

The concepts of the English words replaced by the target words were comparable across the three passages in terms of frequency. That is, the English words had the same ratio of frequency based on a frequency band from Vocabulary Profilers[2] in order to avoid the possible effect of familiarity with the meaning of the target words[3]. The words in each passage include two 1K types (1,000 most frequent words), two 2K types (2,000 most frequent words) and four OFF types (the words which do not belong to 1K, 2K, or academic words). Appendix A shows all the target words and the replaced concepts along with their degree of frequency based on the frequency bands.

Priming passages and questions.

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[2]Vocabulary Profilers (VP) is a web-based program that performs lexical text analysis. This program breaks texts down by word frequencies in the language. The version used in this study is Web VP v2.5 Classic. Based on Laufer and Nation's Lexical Frequency Profiler, most of the English Web VP divided the words of texts into four categories: 1) the most frequent 1000 words of English, 2) the second most frequent thousand words of English, i.e. 1001 to 2000, 3) the academic words of English (550 words that are frequent in academic texts across subjects), and 4) the remainder which are not found on the other lists. VP has been used for a number of research and pedagogical purposes (http://www.lextutor.ca/vp/eng/vp_research.html).

[3]The target words in Webb (2005) were taken from the fifth frequency band in the COBUILD dictionary.

One of the primary interests of the current study was to investigate the impact of receptive and productive tasks on receptive and productive knowledge gains of new and partially known words. The priming phase was conducted to generate three levels of knowledge about the nonsense TWs: no-knowledge (i.e., participants have no familiarity with the words), partial knowledge (i.e., participants recognized the form, but do not know the meanings of the words), and receptive knowledge (i.e., participants know the meanings of the words, but are not able to use them in writing). The priming tasks included reading two passages and completing subsequent questions for each passage. Appendices B1, B2, C1, & C2 illustrate the priming passage and tasks.

The words from Passage 1, *Dave's Adventures on Registration Day* were not shown to the participant until the treatment, representing "totally unknown words." There was no possibility that participants had any prior knowledge about the words because they were nonsense words. The words for partial and receptive knowledge were presented through reading Passage 2, *The Trip to the Supermarket* (Appendix B1), and Passage 3, *Doctor's Appointment* (Appendix C1), such that Passage 3 intended to prompt more developed knowledge (i.e., receptive retention of meaning) than Passage 2 (i.e., recognition of form only). Each passage was accompanied by questions in an attempt to promote initial form and meaning connection. The questions in Passage 2 included questions asking a general category of the target words. For example, the question was, "What do you think the word was about?" Then, the participants were asked to choose one option as an answer: i) a characteristic or quality, ii) an action or state, iii) a person, place or thing, and iv) I don't know. The questions were also presented on a separate page, which prohibited students from looking back at the passage, in order to eliminate

the chance to infer the meaning and engage in more elaborate processing by verifying the words in contexts. Additionally, participants were not allowed to write down anything on the passage to avoid more processing than required due to the writing (see Appendix B2). As for the questions following Passage 3, which targeted receptive knowledge (meaning), the participants were asked to write the inferred meaning of the target word in their L1 (Korean), or to provide any information they could remember if they were not able to recall the meaning. In contrast to the Passage 2 tasks, the questions were presented on the same page in order to promote verifying contexts while looking for the meaning (see Appendix C1). In addition, on a separate page, the correct meaning was provided without explanation, and the participants were asked to evaluate their own answers in order to ensure that they knew the correct meaning of the words. The order of the TWs in the questions was the same as in the passages (see Appendix C2).

With regard to the structure and content of the two passages, they were different in the clues to the meaning and form of the TWs. That is, the taxonomic meaning of *sedal* (bread), one of the target words, was presented in a sentence "Sue wanted to buy *sedal* for breakfast," where the possible meaning is any food for breakfast such as bread, cheese, eggs and so on. Thus, participants might infer the semantic category of the words (i.e., food) but were not able to grasp the exact meaning of the word (i.e., bread). According to a study about partial knowledge of word meaning in L1, *taxonomic information* (e.g., *robin* and *duck*) is more readily available and reliably preferred for adult learners when they process the meaning of unknown words (Whitmore, Shore, & Smith, 2004). For Passage 2, at best, participants might be able to recognize the L2 form but no meaning. In order to prompt receptive knowledge, sentences in Passage 3 were revised to give

transparent clues to the meaning. For example, the meaning for *sarrope* (throat) was prompted in the sentences, "It was cold last night but the heater in the room did not work. Jack had a fever and sore *sarrope* the next morning." Thus, the meaning of the target word *sarrope* could be inferred more clearly in those sentences, and better than in Passage 2.

The two passages (Passages 2 and 3) used for priming prior knowledge were comprised of similar sentences and structurally comparable (Pulido, 2004). However, the passage for priming receptive knowledge (Passage 3) was slightly longer than the one for partial knowledge (Passage 2) due to the necessity of providing more clues to the meaning of the words. The number of tokens used was 144 in Passage 2 and 128 in Passage 3. Table 3 shows that the words used in both passages were comparable in terms of the frequency of words and the number of tokens. Extensive field tests were conducted with Korean ESL students in order to determine a reasonable time for completing the priming tasks. As for Passage 2, the participants had four minutes for reading and two minutes for the subsequent questions. In Passage 3, they were given six minutes for completing reading and tests with one extra minute for checking the answers.

Tasks

The primary focus of the current study was to compare the effect of receptive (reading) and productive tasks (writing) on lexical knowledge development. In order to test the findings in Webb (2005), the current study partially replicated the experiment of Webb (2005) by adopting some of his reading and writing tasks.

Receptive vs. productive vocabulary learning tasks.

The learners in the receptive treatment were given each target word with an L1

Table 3

Comparison of Priming Passages 2 and 3

	Passage 2		Passage 3	
Word Type	Tokens	Percent	Tokens	Percent
K1 Words (1-1000)	106	82.81%	109	75.69%
Function Words	(70)	(54.69%)	(72)	(50.00%)
Content Words	(36)	(28.13%)	(37)	(25.69%)
K2 Words (1001-2000)	4	3.13%	9	6.25%
1K+2K	200	(85.94%)	218	(81.94%)
AWL Words (academic)	1	0.78%	1	0.69%
Off-List Words	17	13.28%	25	17.36%
Total	128	100%	144	100%

on the right side, which were in turn followed by three sentences containing the target word (Appendix D). The learners in the writing group were asked to write a sentence on a blank line using a target word that was presented with a gloss next to each number (Appendix E). In both conditions, the target words were underlined and written in bold following Webb (2005), and the order of the words was randomized, which contributed to offset any effect of episodic memory from the same order of presentation of the target words within the stories or of a common theme related to a particular combination of words (Pulido, 2003). Instructions were given at the top of each page in their L1 (Korean).

Time was controlled for both conditions to eliminate any effect from inconsistent time. Even though time can be considered a part of the treatment in the sense that wring typically requires more time than reading (e.g., Barcroft, 2004b; Webb, 2005), the current study limited the investigation to the same time condition. To control the time, participants were instructed to complete each page including eight target words during 10 minutes, and they were not allowed to turn to the next page without being instructed.

Thus, the participants in both conditions were able to distribute the time equally across three pages during the overall 30 minutes. The time was decided based on Webb (2005)'s experimental condition in which participants were given 12 minutes for 10 target words. This time proved to be enough for both the reading and writing groups from a field test as well.

Receptive treatment sentences.

As for the reading task, three example sentences were presented to the participants for each target word. These sentences were taken from the British National Corpus following Webb (2005). The main criteria for selecting the sentences were whether they represent typical sentences that participants are likely to encounter when reading rather than giving a definition of each word in order to give partial knowledge of meaning (Webb, 2005). To make all the sentences 'equally informative' (Webb, 2005), two native speakers of English who were writing consultants in the Writing Center at MSU evaluated difficulty of the sentences in comprehension. In addition, extensive field-testing was conducted in order to ensure that learners were familiar with most of the running words in the contexts so that most problematic words in sentences could be discarded. The overall number of tokens in the three sentences were adjusted to be similar to offset the possibility of effects for an inconsistent cognitive load for learning each target word ($M = 53.50$, $SD = 1.10$, $min = 52$, $max = 55$). Finally, the lexical density (i.e., content words per total words) was considered so that the example sentences for each word could have similar proportion of content words per function words.

Sentence sight vocabulary test for receptive treatment.

In addition to adjusting all the sentences to be equally informative and

comprehensible, a Sight Vocabulary Test was administered through a word checklist in order to further ensure that the reading was not hampered by unknown running words in the sentence contexts. Sight vocabulary refers to a type of receptive vocabulary competence that related to the vocabulary in the input from which the TWs are to be learned. It has been shown to contribute to text processing, comprehension, lexical inferencing and retention associated with the texts (Pulido, 2003, 2004, 2007). According to the previous studies related to the coverage rate of known words in reading, learners need to know at least 95% (Laufer, 1989); 98 % (Nation, 2001), or even 98-99% (Carver, 1994, cited in Waring & Nation, 2004) of running words for a successful reading.

This test was based on a self-report in which participants were asked to indicate whether they understood the words (Appendix F). The test was conducted with both reading and writing groups at the end of the immediate posttests, and took about ten minutes. To create the test, 140 words were selected out of 1,315 non-target words in the sentence contexts because it was not possible to test every running word in the sentences. Then, all the words were categorized into four types based on their frequency via the Vocabulary Profiler: 1K types, 2K types, AWL, and OFF types. First, the majority of familiar words, including function words, were eliminated from 1K types (e.g., *bag, breakfast, and data*). After consulting with two Korean teachers who have experience in teaching English to Korean university students, the words that the participants might already know were further eliminated. Finally, 140 potentially problematic words were decided: 25 words out of 1,100 (1K types), 33 out of 93(2K types), 29 out of 37 (AWL) and 40 out of 85 (OFF types).

The result showed that the participants in the reading group knew approximately 99.

09 percent of running words in the sentence contexts, which was calculated by subtracting the words that they checked "I don't know" from the total number of non-target running words (N = 1315), then by dividing the number of these words by the total number of words. Thus, the coverage rate, 99.09 %, based on the Sight Vocabulary Test indicated that reading was not hampered by unknown words in the contexts. Table 4 shows the means and coverage rate for both EFL and ESL participants.

Table 4

Sight Vocabulary Test

		M	*SD*	Coverage rate[a]
Reading Group	EFL (n = 18)	127.33	9.34	99.04 %
	ESL (n = 18)	128.83	8.72	99.15 %
	Total (n = 36)	128.08	8.94	99.09 %
Writing Group	EFL (n = 17)	126.70	8.99	99.99%
	ESL (n = 18)	130.11	7.92	99.21%
	Total (n = 35)	128.45	8.51	99.12%

Note. Maximum score = 140.

[a]Coverage rate refers to the proportion of the word that the participants know among all the running words (N = 1315).

Independent Variables

Treatment.

The two tasks, receptive (reading) and productive (writing) tasks served as a between-subjects independent variable.

Learning context.

The two different learning contexts, EFL and ESL also served as a between-subjects variable. EFL and ESL learning contexts were compared to find the potential effect from different learning contexts. Except for the difference in the learning

environment, all the experimental conditions were equal to both EFL and ESL participants.

Word knowledge.

The different degrees of prior knowledge of the target words served as a within-subjects independent variable. The degrees of knowledge were prompted through the priming phase a day before the treatment, and were assessed by the pre-tests. The results from the pre-tests were used to determine whether the priming was successful to promote the described levels of word knowledge. Based on these results, two categories of words were created, unknown words (i.e., the nonsense words that the participants have never encountered), and partially known words (i.e., the words that the participants have recognized) (for detailed description about the priming results, see Results section of this paper).

Time.

Participants' lexical gains were measured on three occasions (i.e., before, immediately following and one week after the treatment).

Dependent Variables

To measure the development of lexical knowledge, pre-tests, immediate posttests, and one-week delayed posttests were conducted. In order to tap into partial knowledge at the initial stage of form-meaning mapping before comprehension or production, the tests measured initial recognition of the form (L2) or concept (L1). In addition, the tests measured receptive and productive knowledge via translation tests, receptive translation (L2 to L1), and productive translation (L1 to L2). The tests were decontextualized in order to avoid the possible effect of context when the participants recalled the target

words' meaning or form. According to Laufer, Elder, Hill, and Congdon (2004), it is neither efficient to use the contexualized measurement in all situations, nor easy to control the type and amount of context in questions. Furthermore, it is not always clear whether contextualized tests actually measure different types of word knowledge, or lexical inferencing skills.

In both tests, all words were presented with the same morpho-syntactic forms as in the treatments (the nouns in their singular forms and the verbs in their infinitive forms). The order of the target words was randomized to help decrease the effect of episodic memory of the order of presentation of the target words in the treatment (Pulido, 2003). The productive tests were given first in order to diminish the effects of subsequent receptive tests. The order of presentation of test items was counter-balanced from the immediate posttest to delayed posttest. Unlimited time was given for the completion of all the tests.

Form (L2) recognition & receptive (L2 to L1) translation tests.

The form (L2) recognition and receptive (L2 to L1) translation tests measured the participants' ability to recognize the form of the target words and supply the L1 translation as the equivalent of tapping receptive knowledge. In the form recognition test, episodic memory of the TW forms was assessed because the ability to recognize new lexical forms is assumed an initial step in lexical knowledge development (e.g., Nation, 2001). An adequate version of Pulido (2004) was used as an L2 to L1 translation test. In addition, the receptive translation test was the same as one of the receptive tests assessing "receptive knowledge of meaning and form" in Webb (2005) and Pulido (2003, 2007). The recognition and translations tests were presented together as seen in an example

below, which was used for the reading group in the posttests;

1) cinow (1) Did this word appear in the reading task you did today? (Yes, No)

(2) Translate this word into the Korean word ( ).

The first question (1) asked whether the words were familiar with the participants based on self-reporting. When they checked "Yes" to the recognition question, they were required to translate the words into L1, or provide any information about the words in L1. If they answer to Question (2), they were instructed to check Question (1) as well (see Appendix G). In addition, each test contained six distractors in order to verify the participants' self-report about their familiarity with the words. Read (1990) recommends having a way to verify the test-takers' judgments about their knowledge when self-report is used. The distractors in the immediate posttests were different from those used in pre-tests that were taken by the participants within the same session. These different distractors helped to avoid the participants' familiarity with the distractors. All the distractors were bi-syllabic nonsense words that were borrowed from Pulido (2004) (e.g., *bosser, creener, fleete, gimmane, mannel*, and *slader* for the pretests) and Webb (2005) (*cader, denent, hodet, pacon sagod* and *tasper* for the posttests).

Concept (L1) recognition & productive (L1 to L2) translation tests.

The concept (L1) recognition and productive (L1 to L2) translation tests measured both an ability to recognize the concepts represented by the nonsense target words and the ability to supply L2 form as productive knowledge. The concept recognition test was devised to tap an initial intake of the concepts before the participants produce the form. According to Jiang (2000)'s a psycholinguistic model of L2 vocabulary acquisition, L2 learners often rely on L1 lemma mediation at the first stage of learning; L2 learners

copied the lemma information of the L1 counterpart into the L2 lexical entry. In production, a pre-verbal message initially required to activate the L1 words whose semantic specifications correspond to the message fragment. Then the L1 words activate the corresponding L2 words through the lexical link between L2 and L1 words (Jiang, 2000). Thus, the concept recognition test intended to tap the initial knowledge required for production. The productive translation test was the same as one of the productive tests in Webb (2005), which assessed 'productive knowledge of meaning and form'. The two types of questions were asked together as seen an example below, which was used for the writing group in the posttests;

1) 계획: (1) Did this word appear in the writing task you did today? (Yes No)

(2) Translate this word into the English word ( ).

The first question asked whether they saw the words corresponding to the Korean meaning during Session 2, based on self-reporting (e.g., "Please indicate whether you saw the words corresponding to Korean words on your tasks during Session 2"). If they answer, "Yes", they were required to write the target words corresponding to the L1 concepts. If they answered Question (2), they were required to answer Question (1) (see Appendix H). This test also included six distractors since the L1 cues in the productive tests might contribute to the following receptive tests, which asked to provide L1 translation of the target words. In other words, if the participants see the translation of *sedal* (bread) in L1, they might be able to provide the meaning for *sedal* in the following test (recognition and receptive translation). Thus, the distractors were L1 words that belonged to same categories as one of the target words (e.g., something to eat for breakfast such as cheese), and the participants were instructed to provide the target words

only for the items that they encountered in the treatment. The distractors were different for each test: the pre-tests and the posttests. In addition, the length of blank space was the same across the questions so that the space length could not give any clues regarding the length of the target words.

Procedures

The entire experiment was conducted using a booklet prepared by the researcher for each session. The booklet included instructions needed to complete each task and test including time limits. The participants were instructed not to turn to the next page without instructions. All the instructions were written in their native language, and were read aloud by the data collectors.

As for the EFL data collection, all the materials and procedures were discussed between the data collector and the researcher before the experiment by phone, e-mail and an instant messenger program. During the experiment, the researcher was communicating with the data collector through the instant messenger program in order to handle the problems that might occur during the experiments. The experiment was conducted in a classroom at the Foreign Language Center of the university one week before the experiment at MSU. As for the ESL data, the instructor initially contacted the subjects. All the sessions in the experiment were offered in an intact class in a building at MSU with the same instruments that were used for the EFL participants. The participants were paid $ 25.00 in cash at the end of their participation. There was one ESL student who did not complete all the sessions and one EFL student who did not complete the tests, so these participants were excluded, leaving a total of 71 participants.

There were three separate data-collection phases. During Session 1, all participants

completed priming tasks by reading two passages and answering the subsequent questions about the primed words. Then, they completed the Vocabulary Levels Tests. The second session was conducted the following day. The participants were randomly divided into two experimental groups, reading (receptive) and writing (productive) groups, and received the corresponding booklets. After taking the pre-tests, participants were instructed to complete the tasks and answer questions related to the task but not warned about the upcoming vocabulary tests. They, then, completed the productive Vocabulary Levels Tests followed by receptive Vocabulary Levels Tests. Finally, they completed unannounced vocabulary tests followed by the Sight Vocabulary Test. Session 3 was conducted one week after Session 2, and assessed the retention of the vocabulary knowledge via an unannounced posttest. In order to avoid the effects from the productive translation test on the following receptive translation test, a 10-minute background questionnaire was given between the productive and receptive tests. Finally, students read debriefing statements at the end of the booklet, which announced that the target words that they saw during Sessions 1 and 2 were not real words.

Scoring

The scoring was done by the researcher (a native speaker of Korean), and the productive tests were checked by a native speaker of English in the Writing Center at MSU with joint decisions made in times of disagreement. With regard to the Vocabulary Levels Tests, the productive knowledge test was scored as correct (1 point) or incorrect (0 point) following the method used in Laufer's (1998) study. An item was scored correct when it was semantically correct (i.e., the appropriate word is used to express the intended meaning). Errors in the wrong grammatical form were not marked as incorrect,

for example, when infinitive verbs instead of past tense were used. Words with spelling errors that did not distort the words were not marked as incorrect either (e.g., *sophomoer* instead of *sophomore*). Most of the incorrect answers included non-words (e.g., *dozzle* instead of *dozen*) or existing words which were not correct in the provided context (e.g., *mountain* instead of *mound*). However, the words belonging to different frequency bands were not marked as correct; for example, an answer *or(ange)* for a question "Her favorite flowers were *or(chids)*", was marked incorrect because the word *orange* belongs to K2 words in spite of being semantically acceptable. Each frequency section consists of 18 items in the productive test, and the maximum score was 90 (18 x 5). The Vocabulary Levels Test for measuring receptive vocabulary was scored as correct or incorrect similar to a multiple-choice test, and each correct answer was given one-point. There are five frequency sections in the test including 30 items for each in the receptive test. Therefore, the maximum score was 150 (30 x 5).

With regard to the pre-tests, immediate posttests and delayed posttests, all the items in the translation tests (L2 to L1 and L1 to L2) were scores as 0, .5, or 1. The partial scores were given to be sensitive to small amounts of learning (Waring, 1997), and sensitive to partial degrees of knowledge. In the receptive translation tests (L2 to L1), half a point was given for the answers where it was clear that the word was partly known. The criteria for partial scores were 1) spelling errors that did not distort the sounds of the words, 2) more than a half of syllables that were correct and more than half of letters that were correct, 3) same consonant clusters with wrong vowels, 4) same vowels with reverted consonants. For example, for a target word *riggle*, *raggle* was considered partially correct but not *rapple* because *rapple* did not have the correct the correct vowels

or consonant clusters. In the productive translation test (L1 to L2), partial scores were awarded when the L1 translations were synonyms, semantically close to the answer, or only violated the part of speech. For example, in the receptive translation test (L2 to L1), half points were given for L1 translation, *진찰대*, which meant "a kind of cot for examination in the hospital" instead of "a room for examination in the hospital". Another example of a partial score was an answer, *체온계*, which means "a clinical thermometer" instead of "body temperature" in their L1, Korean.

Results

Baseline Proficiency and Priming Results

Learner Proficiency

The vocabulary proficiency was measured by the Vocabulary Levels Tests in order to control the intervening variable of proficiency. The reliability indices (*Cronbach's alpha*) for all the tests were .959 for Version 1 (receptive knowledge test) and .882 for Version C (productive knowledge test). Table 5 provides descriptive statistics for the participants' vocabulary size as measured by the Vocabulary Levels Tests. The proportion of words known at a given level was indicated by proportional scores on the Vocabulary Levels Test, as was calculated in previous studies (e.g., Laufer & Nation, 1999; Webb, 2005). The mean scores on Version 1 at the 2,000-word level in the current study was 26.26 out of 30 (SD = 3.89), which was similar to the scores of the participants in Webb (2005), 27.6 out of 30. This score indicated that the participants had receptive knowledge of most of the 2,000 most frequent words and were able to control the words in that level. The learners' mean scores on Version C at the 2,000 level was 11.18 out of 18, which was lower than the score in Webb (2005), 15.1 out of 18. The scores from the present study suggested that the participants had productive knowledge of approximately 1,250 of the 2,000 most frequent words. In addition, the receptive vocabulary was twice as large as the productive vocabulary in both the EFL and the ESL contexts.

No difference between the reading and the writing groups was found in both EFL and ESL contexts, which indicated that the reading and writing groups were equivalent in their proficiency across the contexts. Table 6 shows a t-table for comparing the reading and the writing groups in the EFL and ESL contexts.

Table 5

Comparison of Productive and Receptive Vocabulary Sizes in EFL vs. ESL

		Productive Vocabulary			Receptive Vocabulary		
	Context	*M*	*SD*	Percent	*M*	*SD*	Percent
2K	EFL	9.63	3.40	53%	25.11	4.92	84%
	ESL	12.69	2.23	71%	27.17	2.16	91%
	Total	11.18	3.24	62%	26.15	3.89	87%
3K	EFL	3.69	2.74	20%	20.46	6.50	68%
	ESL	5.08	2.33	28%	23.06	4.70	77%
	Total	4.39	2.62	24%	21.77	5.77	73%
5K	EFL	3.69	2.26	21%	15.77	6.70	53%
	ESL	4.03	2.08	20%	19.11	5.30	64%
	Total	3.86	2.16	21%	17.46	6.22	58%
10 K	EFL	1.29	1.53	6%	3.23	3.52	11%
	ESL	1.78	1.35	11%	6.75	5.01	23%
	Total	1.54	1.45	9%	5.01	4.66	17%
UWL	EFL	6.63	3.08	38%	21.83	6.44	73%
	ESL	7.17	2.40	40%	23.92	4.57	80%
	Total	6.90	2.75	39%	22.89	5.63	76%
Total	EFL	4.98	10.43	28%	17.28	24.05	58%
	ESL	6.15	8.00	34%	20.00	17.79	67%
	Total	5.57	9.67	31%	18.66	22.05	62%

Note. Maximum score for productive test = 90, for receptive test = 150. EFL (n = 35); ESL (n = 36); Total (N = 71).

Table 6

Independent Samples T-test for Vocabulary Levels Test (Reading vs. Writing)

		N	*M (%)*	*SD*	*t*	*p*
			Receptive Vocabulary in EFL			
2K	Reading	18	83	16	-.242	.810
	Writing	17	85	17		
3K	Reading	18	69	23	.193	.848
	Writing	17	68	21		
5K	Reading	18	53	23	.205	.839
	Writing	17	52	22		
10K	Reading	18	13	14	1.194	.241
	Writing	17	8	9		
UWL	Reading	18	74	22	.212	.834
	Writing	17	72	21		
Total	Reading	18	58	16	.292	.772
	Writing	17	57	16		
			Productive Vocabulary in EFL			
2K	Reading	18	55	19	.560	.579
	Writing	17	52	19		
3K	Reading	18	23	18	.943	.352
	Writing	17	18	12		
5K	Reading	18	22	16	.949	.350
	Writing	17	18	7		
10K	Reading	18	7	9	.442	.662
	Writing	17	6	7		
UWL	Reading	18	40	16	.800	.429
	Writing	17	36	15		
Total	Reading	18	29	14	.914	.367
	Writing	17	26	9		
			Receptive Vocabulary in ESL			
2K	Reading	18	91	7	.313	.756
	Writing	18	90	7		
3K	Reading	18	77	16	.210	.835
	Writing	18	76	16		
5K	Reading	18	62	18	-623	.537
	Writing	18	66	18		
10K	Reading	18	22	21	-.033	.974
	Writing	18	23	12		
UWL	Reading	18	79	15	-.252	.803
	Writing	18	80	16		
Total	Reading	18	66	13	-.166	.869
	Writing	18	67	11		

Table 6 *(Cont'd)*

			Productive Vocabulary in ESL			
2K	Reading	18	79	15	-.075	.940
	Writing	18	80	16		
3K	Reading	18	70	11	-.434	.667
	Writing	18	70	14		
5K	Reading	18	27	12	-.720	.476
	Writing	18	29	13		
10K	Reading	18	20	9	.598	.554
	Writing	18	22	11		
UWL	Reading	18	40	11	-.313	.756
	Writing	18	41	12		
Total	Reading	18	34	8	-.306	.761
	Writing	18	35	9		

However, the EFL participants showed lower scores than the ESL students, indicating the ESL students' proficiency was higher than that of the EFL students. The scores showed that differences between the EFL and the ESL contexts were statistically significant. On the receptive knowledge tests, the ESL participants' scores were significantly higher than the EFL participants' scores at all the levels except for UWL (i.e., university words level); on the productive knowledge tests the ESL participants' scores were significantly higher than the EFL participants' scores at the 2K, 3K and 10 K Levels. Table 7 shows a *t*-table for comparing the EFL and the ESL participants' vocabulary proficiency, and Figure 2 illustrates the overall difference between the EFL vs. ESL groups across five levels.

Priming Results

Priming was included in the first phase in order to prime partial knowledge about the nonsense target words. In the priming phase, prior knowledge was operationalized by presenting two-thirds of the nonsense TWs through reading. Passage 2 intended to prime partial recognition (form recognition) without revealing the exact meaning of the TWs

Table 7

Independent Samples T-test for Vocabulary Levels Test (EFL vs. ESL)

		N	*M (%)*	*SD*	*t*	*p*
			Receptive Vocabulary			
2K	EFL	35	84	16	-2.329	.023
	ESL	36	91	7		
3K	EFL	35	68	22	-1.934	.057
	ESL	36	77	16		
5K	EFL	35	53	22	-.2.334	.023
	ESL	36	64	18		
10K	EFL	35	11	12	-.3.391	.001
	ESL	36	23	17		
UWL	EFL	35	73	21	- 1.580	.119
	ESL	36	80	15		
Total	EFL	35	58	16	-.2.739	.008
	ESL	36	67	12		
			Productive Vocabulary			
2K	EFL	35	54	19	-4.449	.000
	ESL	36	70	12		
3K	EFL	35	21	15	-2.292	.025
	ESL	36	28	13		
5K	EFL	35	20	13	.251	.803
	ESL	36	21	12		
10K	EFL	35	6	8	-2.271	.021
	ESL	36	11	8		
UWL	EFL	35	38	17	-. 724	.471
	ESL	36	40	13		
Total	EFL	35	28	12	-2.650	.009
	ESL	36	34	9		

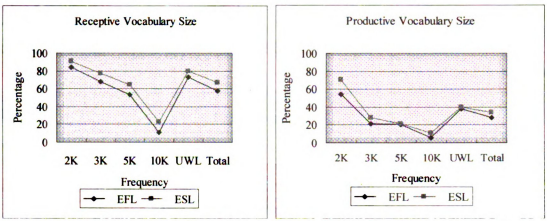


Figure 2. Comparison of EFL vs. ESL on receptive and productive vocabulary sizes.

while Passage 3 intended to prime receptive knowledge (more specific features of meaning) of the TWs. The primed knowledge was measured by the pre-tests since it was necessary to assess the level of knowledge obtained for these words before providing the different treatments. The pre-tests assessed the participants' knowledge about the primed words ($N = 16$) via four types of tests: concept (L1) recognition, form (L2) recognition, receptive (L2 to L1) translation, and productive (L1 to L2) translation. The scores of the words that were not presented to the participants (i.e., unknown words) were assumed zero for these four tests listed above because these words were the nonsense words that the participants had never encountered. The scores from the pre-tests was used to determine whether the pre-tests scores were high enough to be used as an indicator of prior knowledge about the target words, and whether there was pre-existing difference in knowledge between the reading and writing groups.

Table 8 shows the results of the priming phase. The results indicated that the attempts to prime knowledge were partially successful in the sense that partial knowledge (i.e., recognition of the form) was successfully primed but receptive knowledge (i.e., meaning) was not.

Table 8

Comparison of Target Words Primed Through Passage 2 and Passage 3 in the Pre-tests

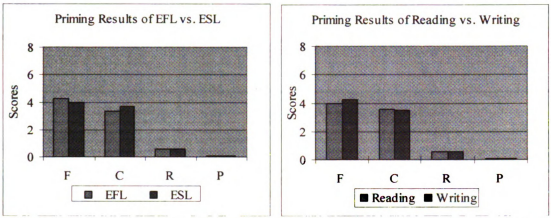
	M	*SD*	*min*	*max*
		Form Recognition (L2)		
Total (N = 16)	12.35	2.66	2.00	16.00
Passage 2 (n = 8)	6.86	1.45	1.00	8.00
Passage 3 (n = 8)	5.49	1.74	1.00	8.00
		Concept Recognition (L1)		
Total (N = 16)	10.62	2.45	4.00	15.00
Passage 2 (n = 8)	3.37	1.86	.00	7.00
Passage 3 (n = 8)	7.25	1.32	1.00	8.00
		Receptive Translation (L2 to L1)		
Total (N = 16)	1.70	1.64	.00	7.00
Passage 2 (n = 8)	0.56	0.94	.00	4.00
Passage 3 (n = 8)	1.13	1.10	.00	5.00
		Productive Translation (L1 to L2)		
Total (N =16)	0.23	0.40	.00	1.50
Passage 2 (n = 8)	0.05	0.19	.00	1.00
Passage 3 (n = 8)	0.18	0.36	.00	1.50

The sores from the form recognition or the concept recognition tests revealed that the participants were able to recognize most target words from Passages 2 and 3 (i.e., they remembered seeing the target word's form (L2) or concept (L1) in the passage they read the previous day). However, the scores from the receptive translation (L2 to L1) tests showed that the participants did not retain most of the TWs as receptive knowledge. Even though the words in Passage 3 intended to prompt their meanings through more transparent cues than Passage 2, the mean score was only 0.18 out of 8 for Passage 2 and 0.05 for Passage 3. These scores were not high enough to be used as an indicator of receptive knowledge, indicating that most of the TWs were not retained as receptive

knowledge. In addition, productive knowledge was not primed as was intended. The scores from productive translation (L1 to L2) tests for each passage were less than .5, indicating that the participants did not have productive knowledge about the TWs from the priming phase.

Based on the results reported above, a baseline of initial word knowledge was established for the nonsense target words. Since there were no noticeable gains in the receptive translation tests, the words from Passages 2 and 3 were collapsed into one category representing recognized words, either conceptually (i.e., target word concept) or formally (i.e., target word form). These words were classified as *partially known words* while the words that were not presented during the priming stage were classified as *unknown words*. The two categories of words were used as two levels of the independent variable of word knowledge for the subsequent data analyses.

Figure 3 illustrates the results of the pre-tests. There was no notable difference between the reading and writing groups, or between the EFL and ESL groups. In order to verify whether there was a statistical difference between the reading and the writing task groups in the EFL and ESL contexts), independent samples *t*-tests were conducted on the pre-test scores. In general, there were no statistically significant differences in either the treatment grouping (the reading and the writing groups) or the learning context grouping (the EFL and the ESL participants) among the tests scores. The scores of reading and writing groups were not different across the tests (Form recognition test, t (69) = -1.226, p = .22, d = .295; Concept recognition test, t(69) = .259, p = .80, d =.062; Receptive translation test, t(69) = -.130, p = .90, d = .031; Productive translation test, t(69) = .214, p = .83, d = .051). In addition, the scores of EFL and ESL groups were not different either



Note. F = Form (L2) Recognition Test; C = Concept (L1) Recognition Test; R = Receptive Translation (L2 to L1) Test; P = Productive Translation (L1 to L2) Test.

Figure 3. Comparison of reading vs. writing, and EFL vs. ESL on priming results.

(Form recognition test, $t(69) = 1.135$, $p = .26$, $d = .273$; Concept recognition test, $t(69) = -1.840$, $p = .70$, $d = .443$; Receptive translation test, $t(69) = -.418$, $p = .68$, $d = .100$; Productive translation test, $t(69) = -.644$, $p = .51$, $d = .155$). These results indicate equivalent knowledge of the participants prior to the administration of the treatments.

Correlation Between Baseline Proficiency Indicators and Priming Results

The vocabulary size as measured by the Vocabulary Levels Test did not reveal a significant correlation with other tests' scores except for the concept recognition test in the pre-tests, $r(70) = .431$, $p < 0.01$ (for the correlation with the dependent variables, see the *Main Results* section). This result shows that proficiency did not play a significant role in lexical learning after the treatments in the present study. However, in the EFL context, vocabulary proficiency was moderately correlated with the responses from the questions presented in priming phases, which indicates that proficiency might affect initial learning at the priming stage (see Table 9 for the correlations in EFL, and Table 10 for the correlations in ESL).

Table 9

Intercorrelations Between Proficiency and Priming Questions in EFL

	1	2	3	4	5
R Voc	1				
P Voc	.826(**)	1			
Passage 2	. 552(**)	.496(**).	1		
Passage 3	. 659(**)	.560(**)	.497(**)	1	

Note. R Voc = Receptive Vocabulary Size; P Voc = Productive Vocabulary Size;
Passage 2 = Questions in Passage 2 which intended to prime form recognition; Passage 3 = Questions in Passage 3 which intended to prime meaning.
* $p < .05$, ** $p < .01$.

Table 10

Intercorrelations Between Proficiency and Priming Questions in ESL

	1	2	3	4	5
R Voc	1				
P Voc	.744(**)	1			
Passage 2	.202	.340(*)	1		
Passage 3	.218	.171	.246	1	

Note. R Voc = Receptive Vocabulary Size; P Voc = Productive Vocabulary Size;
Passage 2 = Questions in Passage 2 which intended to prime form recognition; Passage 3 = Questions in Passage 3 which intended to prime meaning.
* $p < .05$, ** $p < .01$.

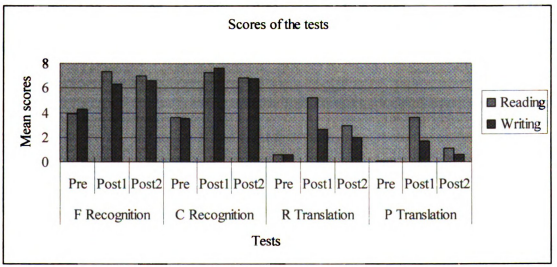
Main Results

Treatment (receptive vs. productive), context (EFL vs. ESL), time (pre-tests, immediate posttests, and delayed posttests a week after the treatment), and knowledge (unknown vs. partially known words) served as the independent variables. The dependent variables were the scores from four types of tests: form (L2) recognition test, concept (L1) recognition test, receptive (L2 to L1) translation test, and productive (L1 to L2) translation test. A general overview of descriptive statistics for each variable is reported below, followed by the descriptive and inferential statistics for each measurement.

Independent Variables

Overall effect of treatment.

Figure 4 and Table 11 show the descriptive statistics for the independent variable of treatment (reading and writing) on overall lexical gains. In the pre-test, there was no noticeable difference between the groups. However, in Posttest 1 conducted immediately after the treatment, the reading group showed better performance than the writing group for three of the four tests (form recognition, receptive and productive translation tests), while the writing group performed slightly better than the reading group for the concept recognition test. In Posttest 2 administered one week later, the reading group's superior performance was observed for the same three tests. However, the gaps between the treatment groups in Posttest 2 were considerably smaller than in Posttest 1 since the reading group's scores decreased markedly, whereas the writing group's scores decreased moderately. These results reveal more forgetting over time by the reading group.



Note. F Recognition = Form (L2) Recognition Test; C Recognition = Concept (L1) Recognition Test; R Translation = Receptive Translation (L2 to L1) Test; P Translation = Productive Translation (L1 to L2) Test.

Figure 4. Comparison of reading and writing groups on overall gains.

Table 11

Comparison of Reading and Writing Groups

	Reading				Writing			
	M	*SD*	*min*	*max*	*M*	*SD*	*min*	*max*
				Form Recognition				
Pre	3.91	1.09	0.67	5.33	4.25	0.71	2.33	5.33
Post1	7.31	0.96	3.33	8.00	6.28	1.00	3.33	8.00
Post2	6.94	1.23	1.67	8.00	6.58	1.00	4.00	8.00
				Concept Recognition				
Pre	3.57	0.81	1.33	5.00	3.51	0.84	1.67	4.67
Post1	7.23	0.82	4.33	8.00	7.63	0.46	6.67	8.00
Post2	6.80	1.37	1.00	8.00	6.74	0.89	4.33	8.00
				Receptive Translation				
Pre	0.57	0.45	0	1.67	0.56	0.63	0	2.33
Post1	5.23	1.72	1.00	8.00	2.64	1.62	0	6.33
Post2	2.96	1.62	0	6.17	2.01	1.35	0	4.83
				Productive Translation				
Pre	0.07	0.13	0	0.5	0.08	0.14	0	0.5
Post1	3.58	1.84	0.17	6.83	1.71	1.51	0	6.00
Post2	1.10	1.25	0	4.33	0.58	0.72	0	2.83

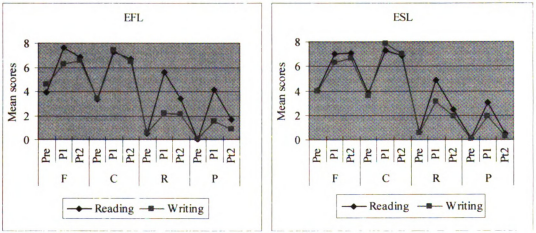
Note. Pre = Pre-test; Post1 = Immediate posttests; Post2 = Delayed posttests one week after the treatment

With regard to the four measurements, both groups performed equally well on both the recognition tests, but showed considerable differences on both the translation tests. On the recognition tests, the scores were close to the maximum in Posttest 1, and these scores were maintained through Posttest 2 without much loss. On the receptive and the productive translation tests, a noticeable gap between the reading and writing groups was observed in Posttest 1, in which the reading group outperformed the writing group, but the gap narrowed in Posttest 2. With regard to receptive and productive knowledge, the

receptive translation test showed higher scores than the productive translation test in both Posttests 1 and 2, showing that receptive knowledge was easier to gain than productive knowledge. When compared to the proportion of losses between Posttests 1 and 2, productive knowledge was forgotten more than receptive knowledge, suggesting that productive knowledge is more likely to decay than receptive knowledge.

EFL vs. ESL learning contexts.

Figure 5 illustrates the descriptive statistics for overall gains of the independent variable of L2 learning context (EFL and ESL) by treatment (the reading and the writing). Concerning the differential effect of reading and writing on lexical gains, no notable differences were found between the EFL and the ESL contexts. In both contexts, the reading group outperformed the writing group on the form (L2) recognition, the receptive translation, and the productive translation tests, and the writing group performed as well as the reading group on the concept recognition test in Posttests 1 and 2. Additionally, the notable difference between the reading and writing groups shown at Posttest 1 decreased in Posttest 2 due to more forgetting by the reading group in both contexts.



Note. Pre = Pre-tests; P1 = Immediate Posttests; P2 = Delayed Posttests. F =Form recognition (L2); C =Concept recognition (L1); R =Receptive translation (L2 to L1); P =Productive translation (L1 to L2).
Figure 5. Comparison of EFL vs. ESL learning contexts on overall gains.

However, the gap between the reading and the writing group were greater for the EFL group than the ESL group. Moreover, when the scores of the EFL and ESL participants were compared within each treatment, the EFL reading group showed higher gains than the ESL reading group, while the ESL writing group performed better than the EFL writing group on both translation tests. This result was observed at both posttest intervals. Furthermore, in Posttest 2, the EFL group showed less forgetting than the ESL group on the translation tests, suggesting that the EFL students tended to retain the words better than the ESL students after one week (for descriptive statistics, see Table 12).

Table 12

Comparison of EFL vs. ESL Learning Contexts on Overall Gain

		EFL ($N = 35$)		ESL ($N = 36$)	
		M	*SD*	*M*	*SD*
		Form Recognition			
Pre	Reading	3.91	1.09	4.07	0.97
	Writing	4.59	0.54	3.93	0.71
Post1	Reading	7.61	0.54	7.00	1.19
	Writing	6.25	0.91	6.29	1.11
Post2	Reading	6.83	1.58	7.05	0.77
	Writing	6.53	1.00	6.63	1.03
		Concept Recognition			
Pre	Reading	3.31	0.88	3.81	0.66
	Writing	3.41	0.891	3.61	0.80
Post1	Reading	7.28	0.82	7.28	0.85
	Writing	7.41	0.52	7.83	0.29
Post2	Reading	6.72	1.60	6.87	1.14
	Writing	6.45	0.99	7.02	0.69

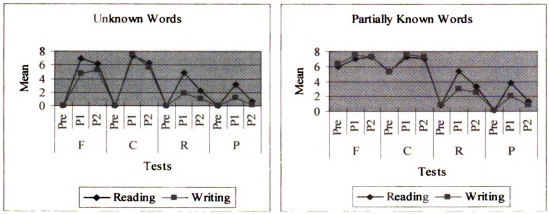
Table 12 *(Cont'd)*

		Receptive Translation			
Pre	Reading	0.51	0.37	0.64	0.52
	Writing	0.57	0.69	0.55	0.59
Post1	Reading	5.61	1.70	4.85	1.70
	Writing	2.15	1.55	3.10	1.60
Post2	Reading	3.43	1.77	2.50	1.36
	Writing	2.12	1.39	1.92	1.35
		Productive Translation			
Pre	Reading	0.03	0.91	0.11	0.15
	Writing	0.10	0.16	0.06	0.12
Post1	Reading	4.11	1.20	3.05	1.54
	Writing	1.52	1.56	1.88	1.49
Post2	Reading	1.69	1.45	0.51	0.63
	Writing	0.87	0.87	0.31	0.40

Note. EFL (reading, n = 18, writing n = 17), ESL (reading, n = 18, writing n = 18). Pre = Pre-test; Post1 = Immediate posttests; Post2 = Delayed posttests.

Unknown vs. partially known words.

Figure 6 illustrates the variable of prior knowledge about the words (unknown vs. the partially known words) related to the reading and the writing groups' overall gains (for descriptive statistics, see Table 13). The unknown words were those nonsense TWs, which were not presented to the participants prior to the treatment, and the partially known words were those presented to them at the priming stage. In the pre-tests, substantial differences between the known and unknown words were observed on the form and the concept recognition tests, but no notable differences were found on the receptive and productive translation tests in both the reading and the writing groups. In Posttest 1, the scores for the partially known words were higher than for the unknown words on the three tests (form recognition, receptive translation, and productive translation); however, there were no observable differences on concept recognition tests,



Note. Pre = Pre-test; Post = Immediate posttest; Post2 = Delayed posttest. F = Form (L2) Recognition Test; C = Concept (L1) Recognition Test; R = Receptive Translation (L2 to L1) Test; P = Productive Translation (L1 to L2) Test.

Figure 6. Comparison of reading and writing groups for unknown vs. partially known words on overall gains.

in which near maximum scores were observed. In Posttest 2, the partially known words were forgotten to a lesser extent than the unknown words in all the tests. Concerning the differential effect of reading and writing tasks, the writing group showed substantially better performance for the partially known words on the form recognition test, whereas the reading group showed only slightly improved scores for the partially known words on this test. This result suggests that the writers' performance was more positively affected by partial knowledge than the readers' performance.

Table 13

Comparison of Unknown vs. Partially Unknown Words

		Reading		Writing	
Time	Knowledge	*M*	*SD*	*M*	*SD*
		Form Recognition			
Pre	UW	0	0	0	0
	KW	5.99	1.53	6.37	1.07
Post1	UW	6.94	1.51	4.74	1.99
	KW	7.04	0.86	7.50	0.59

Table 13 *(Cont'd)*

Post2	UW	6.19	2.10	5.20	1.95
	KW	7.31	1.10	7.27	0.94
		Concept Recognition			
Pre	UW	0	0	0	0
	KW	5.35	1.21	5.27	1.26
Post1	UW	7.36	1.15	7.57	0.69
	KW	7.23	0.74	7.65	0.57
Post2	UW	6.27	1.89	5.63	1.91
	KW	7.05	1.27	7.30	0.78
		Receptive Translation			
Pre	UW	0	0	0	0
	KW	0.86	0.67	0.83	0.95
Post1	UW	4.83	2.0	1.86	1.63
	KW	5.43	1.79	3.03	1.79
Post2	UW	2.29	1.84	1.02	1.09
	KW	3.30	1.79	2.51	1.70
		Productive Translation			
Pre	UW	0	0	0	0
	KW	0.11	0.19	0.12	0.21
Post1	UW	3.18	2.01	1.14	1.59
	KW	3.78	1.93	1.99	1.60
Post2	UW	0.65	1.09	0.17	0.45
	KW	1.32	1.48	0.79	0.93

Note. UW = Unknown words; KW = Partially known words

Correlations Between Proficiency and Dependent Variables

Table 14, 15, 16, and 17 present the Pearson Correlations among the baseline proficiency indicators (i.e., vocabulary size for the reading and the writing group, and sight vocabulary for the reading group) and the dependent variables (concept recognition,

form recognition, receptive translation, and productive translation scores). In general, vocabulary proficiency did not play a significant role in lexical gains and retentions. Table 14 shows the correlations in the reading group. In the reading group for the unknown words, only a positive correlation between receptive vocabulary proficiency and a measurement was observed on the concept recognition test in Posttest 2; for the partially known words, only one positive correlation was found between productive proficiency and the concept recognition test scores in the pre-tests. Table 15 shows the correlations in the writing group. There were only a few correlations found between proficiency and measurements. In the writing group for the unknown words, receptive and productive vocabulary proficiency were positively correlated with the concept recognition test in Posttest 1; for the partially known words, both receptive and productive vocabulary proficiency were positively correlated with the concept recognition test in the pre-tests, and productive vocabulary proficiency was correlated with the receptive translation tests in the pre-tests. In sum, no consistent correlation was found between proficiency and measurements. These results reveal that vocabulary proficiency might not significantly affect lexical gains and retention in the current study. In addition, the sight vocabulary tests in the reading treatment did not show notable correlations with the measurements. However, the sight vocabulary test was highly correlated with receptive vocabulary proficiency, $r\ (36) = .782, p < .01$, and with productive vocabulary, $r\ (36) = .638, p < .01$, in the reading group.

Table 16 and 17 show the correlations between the dependent variables for the EFL and the ESL contexts. In general, the scores in Posttest 1 and Posttest 2 were moderately correlated with each other in both contexts.

Table 14

Correlations Between Proficiency and Dependent Variables in the Reading Group

	Pre F	Pre C	Pre R	Pre P	P1 F	P1 C	P1 R	P1 P	P2 F	P2 C	P2 R	P2 P
						Unknown Words						
R Voc.	.	.	.	.	.192	.237	.161	.018	.087	.345(*)	.057	-.105
P Voc	.	.	.	.	-.004	.313	.070	.114	-.033	.320	.004	-.104
SV	.	.	.	.	.335(*)	.222	.243	.164	.128	.382(*)	.041	-.016
						Partially Known Words						
R Voc.	.035	.224	-.063	-.027	.246	.017	.082	-.104	.085	.238	-.104	-.327
P Voc	-.001	.422(*)	.080	-.062	.313	.149	.164	.053	.181	.240	.098	-.131
SV	.026	.266	-.174	-.212	.173	-.059	.112	.018	-.006	.148	-.083	-.284

Note. R Voc = Receptive Vocabulary Size; P Voc = Productive Vocabulary Size; SV = Sight Vocabulary. Pre F = Pre-test, Form Recognition; Pre C = Pre-test, Concept Recognition; Pre R = Pre-test, Receptive translation; Pre P = Pre-test, Productive Translation. P1 = Immediate posttest. P2 = Delayed posttest. * $p < .05$, ** $p < .01$.

Table 15

Correlations Between Proficiency and Dependent Variables in the Writing Group

	Pre F	Pre C	Pre R	Pre P	P1 F	P1 C	P1 R	P1 P	P2 F	P2 C	P2 R	P2 P
						Unknown Words						
R	.	.	.	.	-.236	.451(**)	-.167	-.124	.027	-.138	-.268	-.406(*)
P	.	.	.	.	-.093	.383(*)	.032	.064	.048	-.126	-.200	-.216
						Known Words						
R.	-.195	.518(**)	.204	-.374(*)	-.136	.080	-.041	-.235	-.067	-.077	-.186	-.621(**)
P	-.261	.521(**)	.390(*)	-.288	-.157	.281	.209	-.019	-.100	.040	.063	-.511(**)

Note. R Voc = Receptive Vocabulary Size; P Voc = Productive Vocabulary Size; SV = Sight Vocabulary. Pre F = Pre-test, Form Recognition; Pre C = Pre-test, Concept Recognition; Pre R = Pre-test, Receptive translation; Pre P = Pre-test, Productive Translation. P1 = Immediate posttest. P2 = Delayed posttest. * $p < .05$, ** $p < .01$.

Table 16

Intercorrelations Among Dependent Variables in EFL

	1	2	3	4	5	6	7	8	9	10	11	12
1 Pre F	1											
2. Pre C	.93	1										
3. Pre R	-.090	.149	1									
4. Pre P	.48	.211	.342(*)	1								
5. P1 F	-.058	-.148	-.029	.168	1							
6. P1 C	.353(*)	.131	.039	.011	-.009	1						
7. P1 R	-.263	-.111	.305	.081	.745(**)	-.029	1					
8. P1 P	-.078	.029	.303	.168	.660(**)	.121	.921(**)	1				
9. P2 F	.628(**)	.113	-.110	.130	.351(*)	.550(**)	.095	.270	1			
10. P2 C	.674(**)	.203	-.068	.129	.304	.588(**)	.182	.371(*)	.753(**)	1		
11. P2 R	.277	-.052	.391(*)	.246	.535(**)	.126	.691(**)	.766(**)	.466(**)	.416(*)	1	
12. P2 P	.321	-.131	.192	.296	.497(**)	-.072	.612(**)	.708(**)	.375(*)	.383(*)	.877(**)	1

Note. Pre F = Pre-test, Form Recognition; Pre C = Pre-test, Concept Recognition; Pre R = Pre-test, Receptive Translation; Pre P = Pre-test, Productive Translation. P1 = Immediate posttest. P2 = Delayed posttest. * $p < .05$, ** $p < .01$.

Table 17

Intercorrelations Among Dependent Variables in ESL

	1	2	3	4	5	6	7	8	9	10	11	12
1 Pre F	1											
2. Pre C	.345(*)	1										
3. Pre R	.051	.260	1									
4. Pre P	-.362(*)	-.123	.259	1								
5. P1 F	.060	.187	.154	.030	1							
6. P1 C	-.027	-.021	.208	-.183	.359(*)	1						
7. P1 R	-.065	.115	.361(*)	.234	.572(**)	.171	1					
8. P1 P	-.053	.077	.281	.411(*)	.435(**)	.138	.794(**)	1				
9. P2 F	.240	.110	.057	.165	.344(*)	-.013	.434(**)	.277	1			
10. P2 C	.121	.097	-.024	-.048	.406(*)	.463(**)	.338(*)	.184	.587(**)	1		
11. P2 R	-.045	.243	.343(*)	.289	.346(*)	.222	.789(**)	.733(**)	.405(*)	.385(*)	1	
12. P2 P	-.100	.151	.513(**)	.474(**)	.058	.142	.424(*)	.558(**)	.031	.031	.559(**)	1

Note. See *Note* in Table 16.

Dependent Variables

To address the research questions, several multivariate analyses of variance (MANOVA) were performed, using each score of the four tests as the dependent variables. The alpha level was set at .05 for all of the statistical analyses. The results corresponding to each test type are reported below.

Form (L2) recognition test.

Table 18 and Figure 7 show the results of the form (L2) recognition tests. In the pre-test for unknown words, there was no difference between groups because all the scores were assumed to be zero; for the partially known words, no notable difference between the reading and the writing groups was found in either the EFL or the ESL contexts. In Posttest 1 for the unknown words, the reading group revealed considerably better performance than the writing group in both the EFL and the ESL contexts; for the partially known words, the difference between the reading and writing groups decreased remarkably in both contexts due to the improvement of the writing group's scores in both contexts. Particularly, the EFL writing group showed the most noticeable improvement. In Posttest 2 for unknown words, the reading group's performance was still better than the writing group's in both contexts; for the partially known words, the writing group showed even slightly higher scores than the reading group. These results suggest that the writing task may have had a facilitative effect for the partially known words.

The results of the MANOVA revealed a significant main effect for treatment, $F(1, 402) = 18.465, p < .001, \eta^2 = .044$, for time, $F(1, 402) = 147.209, p < .001, \eta^2 = .423$, and for knowledge, $F(1, 402) = 575.032, p < .001, \eta^2 = .589$. No significant main effect for context was found, $F(1, 402) = .011, p = .916, \eta^2 = .000$.

Table 18

Means and Standard Deviations on Form (L2) Recognition Test

	EFL				ESL			
	Reading		Writing		Reading		Writing	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Pre								
UW	0	0	0	0	0	0	0	0
KW	5.86	1.63	6.88	0.82	6.11	1.46	5.89	1.06
Post1								
UW	7.33	1.28	4.24	2.17	6.56	1.65	5.22	1.73
KW	7.75	0.49	7.26	0.70	7.22	1.20	6.83	0.95
Post2								
UW	6.00	2.30	4.53	2.21	6.39	1.94	5.83	1.47
KW	7.25	1.41	7.53	0.65	7.39	0.70	7.03	1.12

Note. UW = Unknown words, KW = Known words. Pre = Pre-tests, Post1 = Immediate posttests, Post2 = Delayed posttests. Maximum score = 8.

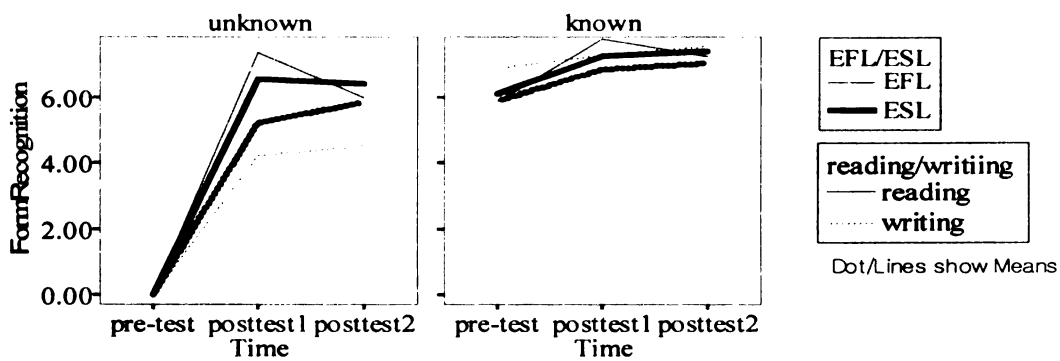


Figure 7. Comparison of means among EFL reading, EFL writing, ESL reading, and ESL writing on the Form (L2) Recognition Test.

However, these significant effects are qualified by significant two-way interactions between knowledge and treatment, $F(2, 402) = 16.755, p < .001, \eta^2 = .040$, between time and treatment, $F(2, 402) = 11.805, p < .001, \eta^2 = .055$, between knowledge and time, $F(2, 402) = 147.109, p < .001, \eta^2 = .423$, and between knowledge and context, $F(2, 402) =$

6.643, $p < .05$, $\eta^2 = .016$. Moreover, these are qualified by subsequent three-way interactions among knowledge, context, and treatment, $F(2, 402) = 8.423, p < .01$, $\eta^2 = .021$, and among time, context, and treatment, $F(2, 402) = 3.051, p < .05$, $\eta^2 = .015$.

Figure 8 shows the three-way interaction between knowledge, context, and treatment. In order to explore this interaction, post hoc *t*-tests were conducted on the scores of the reading and writing groups in each context for the unknown words vs. the partially known words. Table 19 shows the results from the tests. In Posttest 1 for the unknown words, the reading task revealed more facilitative effects than the writing task in both EFL and ESL, but for the known words, this superior effect of the reading task was observed only in the EFL contexts. Additionally, in the pre-test for the partially known words, the writing group's better performance than the reading group was observed in the EFL context.

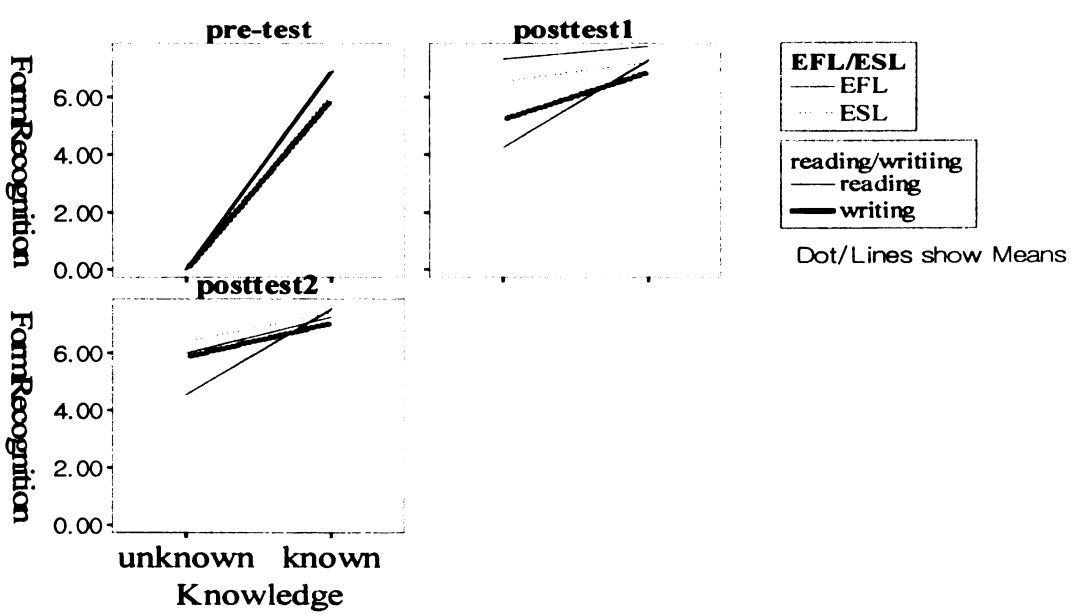


Figure 8. Interactions among knowledge, context, and treatment on the Form (L2) Recognition Test.

Table 19

Independent Samples t- Tests for the Reading and Writing groups in EFL and ESL (Form Recognition Test)

	EFL	ESL
Pre-test		
UW	——— [a]	——— [a]
KW	$t(33) = -2.315, p < .05, d = .806$ [b]	$t(34) = .522, p = .605, d = .179$
Posttest 1		
UW	$t(33) = 5.184, p < .001, d = 1.804$ [c]	$t(34) = 2.361, p < .05, d = .809$ [c]
KW	$t(33) = 2.362, p < .05, d = .822$ [c]	$t(34) = 1.074, p = .290, d = .368$
Posttest 2		
UW	$t(33) = 1.926, p = .063, d = .671$	$t(34) = .968, p = .340, d = .332$
KW	$t(33) = -.742, p = .463, d = .258$	$t(34) = 1.163, p = .253, d = .128$

Note. UW = Unknown words; KW = partially known words. Negative *t* value means the writing group's higher scores and positive *t* value means the reading group's higher scores.

[a] In pre-test for Unknown words, scores were assumed to be zero for all groups compared. [b] The writing group's scores were significantly higher than the reading group's scores. [c] The reading group's scores were significantly higher than the reading group's scores.

In order to explore the interaction between knowledge, context, and treatment further, post hoc paired *t*-tests were conducted for the unknown words vs. the partially known words for each grouping. In the pre-test, all groups showed significant differences ($p < .001$) for the scores between the unknown and the partially known words. In Posttest 1, the writing group showed significantly higher scores for the partially known words both in the EFL ($t(16) = -5.685, p < .001, d = 1.880$) and in the ESL contexts ($t(17) = -5.209, p < .001, d = 1.151$). However, the reading group did not show any differences either in the EFL ($t(17) = -1.286, p = .216, d = .429$) or the ESL contexts ($t(17) = -1.985, p = .063, d = .461$). These results suggest that the writing task resulted in better scores for the known words than the reading task. In Posttest 2, the reading group in EFL ($t(17) = -3.220, p < .01, d = .654$) showed significantly higher scores for the partially known words in addition to the writing groups in EFL ($t(16) = -6.113, p < .001, d = 1.841$) and in

ESL($t(17) = -3.409, p < .01, d = .916$). However, the ESL reading ($t(17) = -2.020, p = .059, d = .562$) did not show any differences between the unknown words and the partially known words in Posttest 2. These results indicate that the difference between the unknown words and the partially known words increased on this test one week later. In sum, the interaction between knowledge, context, and treatment revealed that the writing group in both contexts showed significantly higher scores for partially known words in Posttest 1 regardless of the contexts. However, in Posttest 2, all the groups showed significantly higher scores for partially known words except for the ESL reading group.

Figure 9 illustrates the three-way interaction between time, context, and treatment. In order to investigate the interaction, post hoc paired samples *t*-tests were conducted for the pre-test vs. Posttest 1, the pre-test vs. Posttest 2, and Posttest 1 vs. Posttest 2. Table 20 shows the results from the tests. Significant differences between the pre-test vs. Posttest 1, and the pre-test vs. Posttest 2 were found in the reading and the writing groups across the contexts, suggesting significant gains in Posttests 1 and 2. However, the difference between Posttests 1 and 2 was found only in the EFL reading group, which indicates the significant retention loss of the EFL reading group a week later.

In sum, the form recognition test showed complex interactions between knowledge, context, and treatment, and between time, context, and treatment. The reading group outperformed the writing group in Posttest 1 but there was no difference between them in Posttest 2, and these results were observed in both contexts. The different learning contexts played a role in forgetting of lexical gains, but did not affect the immediate gains. Concerning partial knowledge, the writing group did not show better performance than the reading group for the partially known words. However, the writing group showed

significantly improved scores for the partially known words than the reading group in Posttest 1. This result implies that the writing task might have a potential effect for learning partially known words.

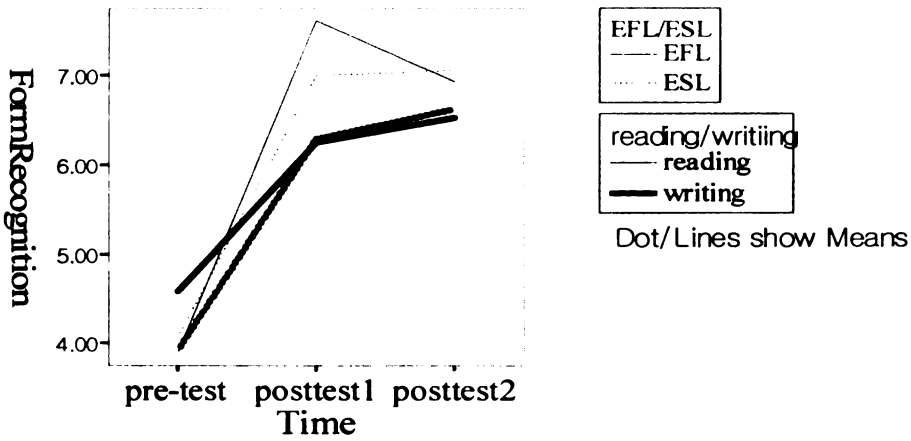


Figure 9. Interaction among time, context, and treatment on the Form (L2) Recognition Test

Table 20

Paired Samples t-Tests for Time Intervals in the Reading and Writing Groups (Form Recognition Test)

	Reading	Writing
	EFL	
Pre - P1	$t(17) = -15.377, p < .001, d = 4.310$[a]	$t(16) = -7.656, p < .001, d = 2.221$[a]
Pre - P2	$t(17) = -12.409, p < .001, d = 2.155$[b]	$t(16) = -9.779, p < .001, d = 2.409$[b]
P1 - P2	$t(17) = 2.341, p < .05, d = .658$[c]	$t(16) = -1.053, p = .308, d = .287$
	ESL	
Pre - P1	$t(17) = -7.971, p < .001, d = 2.687$[a]	$t(17) = -8.101, p < .001, d = 2.550$[a]
Pre - P2	$t(17) = -11.149, p < .001, d = 3.385$[b]	$t(17) = -10.826, p < .001, d = 3.062$[b]
P1 - P2	$t(17) = -.210, p = .836, d = .054$	$t(17) = -1.049, p = .309, d = .323$

Note. Pre - P1 = Pre-test and Posttest 1; Pre - P2 = Pre-test and Posttest 2; P1 - P2 = Posttest 1 and Posttest 2.

[a]Significant difference between the pre-test and Posttest 1 was found. [b]Significant difference between the pre-test and Posttest 2 was found. [c]Significant difference between the Posttest 1 and Posttest 2 was found.

Concept (L1) recognition test.

Table 21 and Figure 10 show the results from the concept (L1) recognition tests. In the pre-test for the unknown words, no difference between the reading and the writing groups was found in either the EFL or ESL contexts; for the partially known words, similarly, no difference between the groups was found. In Posttest 1 for the unknown words, all groups showed near maximum scores; for the partially known words, however, the writing group showed slightly higher scores than the reading group. In Posttest 2 for the unknown words, the reading group was slightly better than writing group in both EFL and ESL; for the partially known words, however, the writing group showed higher scores than the reading group in both EFL and ESL contexts.

Table 21

Means and Standard Deviations on Concept (L1) Recognition Test

	EFL				ESL			
	Reading		Writing		Reading		Writing	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Pre								
UW	0	0	0	0	0	0	0	0
KW	4.97	1.32	5.12	1.33	5.72	0.99	5.42	1.20
Post1								
UW	7.39	1.03	7.47	0.80	7.33	1.28	7.67	0.59
KW	7.22	0.81	7.39	0.70	7.25	0.70	7.92	0.19
Post2								
UW	6.22	1.83	5.24	2.17	6.33	2.00	6.00	1.60
KW	6.97	1.52	7.06	0.95	7.14	1.00	7.53	0.50

Note. UW = Unknown words, KW = Known words. Pre = Pre-tests, Post1 = Immediate posttests, Post2 = Delayed posttests. Maximum score = 8.

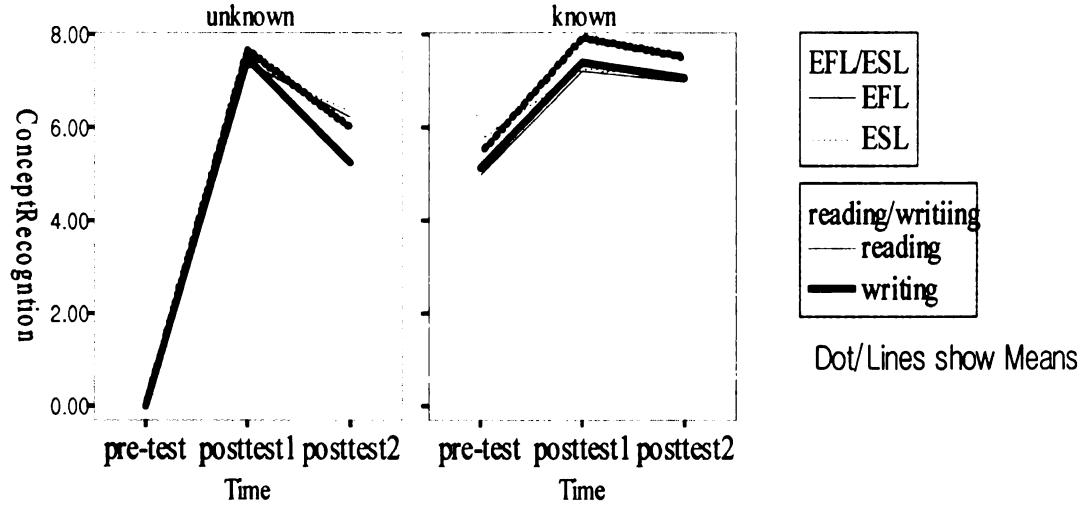


Figure 10. Comparison of means among EFL reading, EFL writing, ESL reading, and ESL writing on the Concept (L1) Recognition Test.

The results of the MANOVA revealed a significant main effect for context, $F(1, 402) = 6.223, p < .05, \eta^2 = .015$, where the ESL group was better than the EFL group for reading and writing, and for known words and unknown words. Also, there were main effects for knowledge, $F(1, 402) = 369.554, p < .01, \eta^2 = .497$, and for time, $F(1, 402) = 731.454, p < .001, \eta^2 = .784$, but these effects were qualified by a significant interaction between knowledge and time, $F(2, 402) = 217.946, p < .001, \eta^2 = .520$. There was no significant main effect for treatment, $F(1, 402) = .033, p = .856, \eta^2 = .000$, which indicates that the different treatments did not play a role on this test, and all the participants tended to remember the concepts that they had encountered during reading or writing.

Figure 11 illustrates the significant interaction between time and knowledge. In order to investigate the interaction, post hoc paired samples *t*-tests for the pre-test vs.

Posttest 1, the pre-test vs. Posttest 2, and Posttest 1 vs. Posttest 2 were conducted for the unknown words and the partially known words (see Table 22). Significant differences were observed across each time interval, which suggests that there were considerable lexical gains for both the unknown words and the partially known words in Posttests 1 and 2, and the gains decayed significantly one week later. However, the effect size was larger for the unknown words than the partially known words in the time interval between the pre-test and Posttest 1 and the pre-test and Posttest 2. This result suggests that the gains in Posttests and 2 were the larger for the unknown words. In addition, the effect size was larger for the unknown words than the partially known words in the time interval between Posttest 1 and Posttest 2, which reveals that the unknown words were forgotten more than the partially known words. In sum, the interaction between time and knowledge suggest that the gains were greater for the unknown words but retention loss was greater for the unknown words as well.

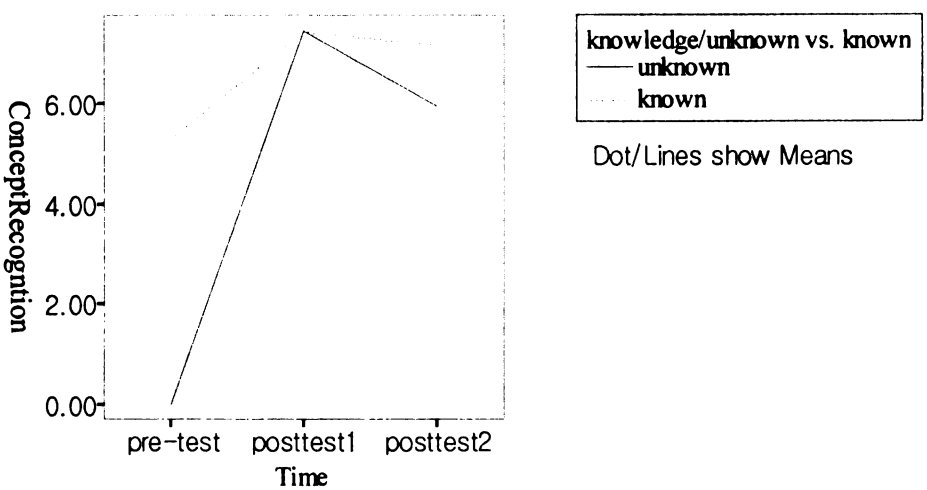


Figure 11. Interaction between time and knowledge on the Concept (L1) Recognition Test.

Table 22

Paired Samples t-Tests for Time Intervals in the Unknown Words and the Partially Known Words (Concept Recognition Test)

	UW	KW
Pre - P1	$t(70) = -65.956, p < .001, d = 11.076$[a]	$t(70) = -12.900, p < .001, d = 2.147$[a]
Pre - P2	$t(70) = -26.206, p < .001, d = 9.207$[b]	$t(70) = -10.852, p < .001, d = 2.105$[b]
P1 - P2	$t(70) = 6.979, p < .001, d = .996$[c]	$t(70) = 2.523, p < .05, d = .299$

Note. UW = Unknown words; KW = Partially known words. Pre - P1 = Pre-test and Posttest 1; Pre - P2 = Pre-test and Posttest 2; P1 - P2 = Posttest 1 and Posttest 2.
[a]Significant difference between the pre-test and Posttest 1 was found. [b]Significant difference between the pre-test and Posttest 2 was found. [c]Significant difference between the Posttest 1 and Posttest 2 was found.

Receptive (L2 to L1) translation test.

Table 23 and Figure 12 illustrate the results from the receptive (L1 to L2) translation tests. In the pre-test, for both the unknown and the partially known words, there was no notable difference between groups (the mean scores for partially known words were less than 1.0 out of 8.0). In Posttest 1, the reading group generally outperformed the writing group in both EFL and ESL contexts for both the unknown words and the partially known words. However, the difference between the reading and writing groups was greater in EFL than in ESL, and for the partially known words than for the unknown words. In Posttest 2 for the unknown words, the reading group still achieved better scores than the writing group in both EFL and ESL contexts, but the differences decreased considerably compared to Posttest 1 due to a marked reduction in the reading group's gains. In Posttest 2 for the partially known words, the EFL students revealed higher scores than the ESL students in both the reading and the writing groups, suggesting that the EFL students experienced less forgetting than the ESL students. In addition, when the learning contexts were compared within each treatment group, the

Table 23

Means and Standard Deviations on Receptive (L2 to L1) Translation Test

	EFL				ESL			
	Reading		Writing		Reading		Writing	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Pre								
UW	0	0	0	0	0	0	0	0
KW	0.76	0.56	0.85	1.04	0.96	0.79	0.82	0.89
Post1								
UW	5.05	2.13	1.44	1.74	4.61	1.98	2.25	1.44
KW	5.89	1.64	2.50	1.68	4.97	1.86	3.53	1.80
Post2								
UW	2.89	1.99	1.00	1.00	1.69	1.50	1.06	1.21
KW	3.70	1.81	2.68	1.72	2.90	1.72	2.35	1.72

Note. UW = Unknown words, KW = Known words. Pre = Pre-tests, Post1 = Immediate posttests, Post2 = Delayed posttests. Maximum score = 8.

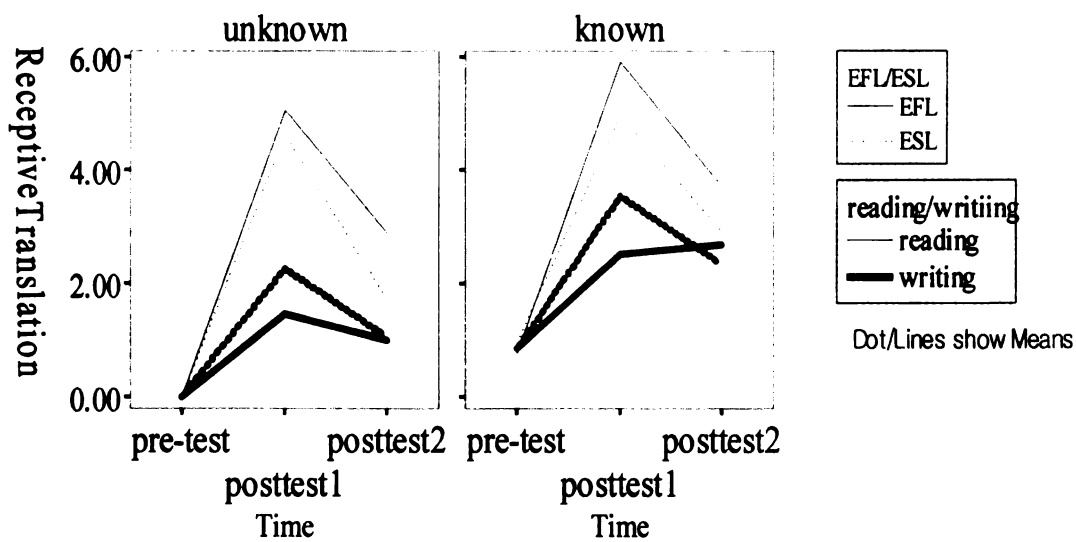


Figure 12. Comparison of means among EFL reading, EFL writing, ESL reading, and ESL writing on the Receptive (L2 to L1) Translation Test.

EFL reading group performed better the ESL reading group, while the ESL writing group performed better than the EFL writing group in Posttest 1. This result suggests that the reading task might be more beneficial in EFL than in ESL while the writing task might be more beneficial in ESL than in EFL.

The results of the MANOVA revealed a significant main effect for knowledge, $F(1, 402) = 50.754$, $p < .001$, $h2 = .112$, where the partially known words revealed better scores than the unknown words. Also, there were main effects for treatment, $F(1, 402) = 80.108$, $p < .001$, $h2 = .166$, and for time, $F(1, 402) = 194.309$, $p < .001$, $h2 = .492$; however there was no main effect found for context, $F(1, 402) = .943$, $p = .332$, $h2 = .002$. These effects were qualified by significant two-way interactions between time and treatment, $F(2, 402) = 31.707$, $p < .001$, $h2 = .136$, and between context and treatment, $F(2, 402) = 7.847$, $p < .01$, $h2 = .019$. Furthermore, the two-way interactions were qualified by a three-way interaction between time, context and treatment, $F(2, 402) = 3.169$, $p < .05$, $h2 = .016$.

Figure 13 illustrates the three-way interaction among time, context and treatment. In order to investigate the interaction, post hoc paired samples *t*-tests were conducted for the pre-test vs. posttest1, the pre-test vs. Posttest 2, and Posttest 1 vs. Posttest 2. Table 24 shows the results from the tests. Significant differences between the pre-test vs. Posttest 1, and the pre-tests vs. Posttest 2, were found in the reading and writing groups across the contexts. In the time interval between Posttest 1 and Posttest 2, all the groups (i.e., the EFL reading and writing groups, and the ESL reading and writing groups) showed significant differences except for the EFL writing group. These results indicate that all the groups gained lexical knowledge in Posttests 1 and 2 compared to the pre-test, but

were not able to retain the gains one week later except for the EFL writing group

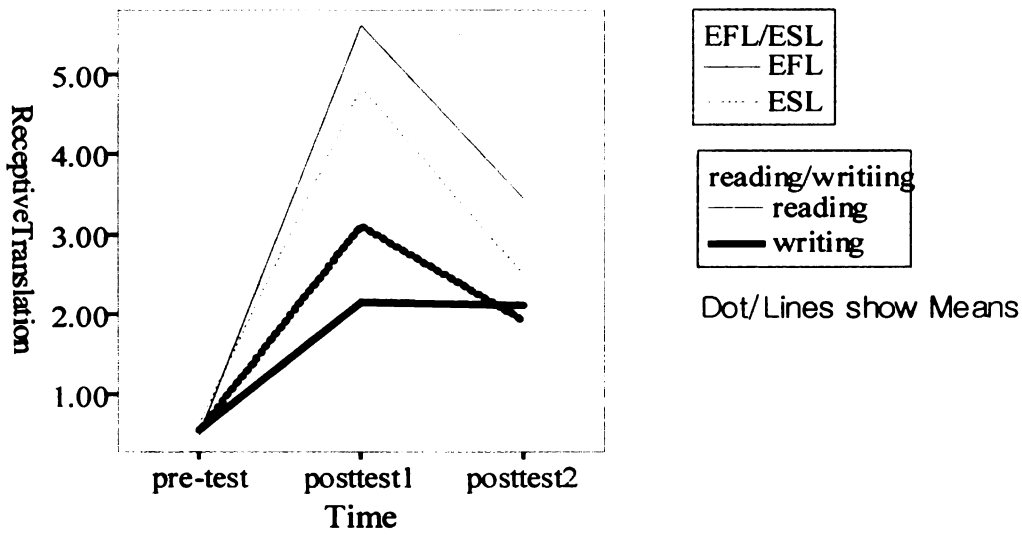


Figure 13 Interactions among time, context and treatment on the Receptive (L2 to L1) Translation Test.

In order to test the differential effect of the treatment in each context, post hoc *t*-tests were conducted for the reading and writing groups in each learning context. In the pre-tests, there were no significant differences between the reading and writing group in either the EFL context ($t(33) = -.318$, $p = .752$, $d = -.111$) or the ESL context ($t(34) = .785$, $p = .623$, $d = .269$). In Posttest 1, the reading group significantly outperformed the writing group in the EFL context ($t(33) = 6.288$, $p < .001$, $d = 2.189$) and in the ESL context ($t(34) = 3.186$, $p < .01$, $d = 1.093$), and the effect size was larger for the EFL context. In Posttest 2, the more beneficial effect of reading was found only in the EFL context ($t(33) = 2.424$, $p < .05$, $d = .844$), but not in the ESL context ($t(34) = 1.292$, $p = .205$, $d = .443$). This result suggests that the EFL participants were more strongly affected by the different types of learning.

Table 24

Paired Samples t-Tests for Time Intervals in the Reading and Writing Groups (Receptive Translation Test)

	Reading	Writing
	EFL	
Pre - P1	$t(17) = -13.328, p < .001, d = 4.153$[a]	$t(16) = -5.515, p < .001, d = 1.314$[a]
Pre - P2	$t(17) = -7.572, p < .001, d = 2.283$[b]	$t(16) = -5.368, p < .001, d = 1.410$[b]
P1 - P2	$t(17) = 5.365, p < .001, d = 1.261$[c]	$t(17) = .158, p = .876, d = .020$[d]
	ESL	
Pre - P1	$t(17) = -10.391, p < .001, d = 3.351$[a]	$t(17) = -8.200, p < .001, d = 2.124$[a]
Pre - P2	$t(17) = -5.744, p < .001, d = 1.806$[b]	$t(17) = -4.924, p < .001, d = 1.315$[b]
P1 - P2	$t(17) = 9.524, p < .001, d = 1.527$[c]	$t(17) = 5.404, p < .001, d = .802$[c]

Note. Pre - P1 = Pre-test and Posttest 1; Pre - P2 = Pre-test and Posttest 2; P1 - P2 = Posttest 1 and Posttest 2.

[a]Significant difference between the pre-test and Posttest 1 was found. [b]Significant difference between the pre-test and Posttest 2 was found. [c]Significant difference between the Posttest 1 and Posttest 2 was found. [d]No significant difference between the Posttest 1 and Posttest 2 was found only in this group.

In addition, in order to test the relative strength of the learning contexts within each treatment, post hoc *t*-tests were conducted on the two contexts in each treatment group, but no significant difference was observed between the EFL and the ESL groups in any of the treatment groups. In the pre-test, no difference between the EFL and ESL groups was found in either the reading group ($t(34) = -0.855, p = .399, d = .293$) or the writing group ($t(33) = .103, p = .919, d = .036$). Also, no difference was found in either the reading group ($t(34) = 1.341, p = 0.189, d = .460$) or the writing group ($t(33) = -1.793, p = .082, d = .624$) in Posttest 1, or in Posttest 2 (the reading group, $t(34) = 1.761, p = .087, d = .604$); the writing group, $t(33) = .434, p = .667, d = .151$). This result illustrates that the relative strength of the reading task in the EFL and the writing task in ESL, which

were observed in the mean scores, were not statistically significant. In sum, the interaction between time, treatment, and context revealed that the EFL context and the writing task played a role in retaining the gains a week later.

Productive (L1 to L2) translation test.

Table 25 and Figure 14 illustrate the results from the productive (L1 to L2) translation tests. In the pre-test, no notable difference between the treatment groups was found for either the unknown words or the partially known words, (the mean scores for partially known words were less than .5 out of 8.0). In Posttest 1 for the unknown words, the reading group generally outperformed the writing group in both the EFL and the ESL contexts. However, the difference between the reading and writing groups was greater in EFL than in ESL. In Posttest 1 for the partially known words, a similar result was maintained. However, the EFL writing group, which showed the lowest scores among the groups compared (i.e., the EFL reading and writing groups, the ESL reading and writing groups) for the unknown words, revealed notably higher scores for the partially known words, even though the reading group's scores were still slightly higher than those of the writing group.

In Posttest 2 for both the unknown word and the partially known words, the reading group still revealed better scores than the writing group in both contexts, but the differences decreased substantially due to more forgetting of the reading group. Particularly, the EFL writing group showed remarkably less forgetting for the partially known words, which suggests that the EFL contexts and the writing treatment resulted in better retention after one week. In addition, when the ESL and EFL groups were compared within each treatment, for both the unknown words and the known words, the

EFL reading group was better than the ESL reading group and the ESL writing group was better than the EFL writing group in Posttest 1. This result suggests that the reading task might be more beneficial in EFL than in ESL while the writing task might be more beneficial in ESL than in EFL. However, in Posttest 2 for both the unknown words and the known words, the EFL group outperformed the ESL group within each treatment, suggesting that the EFL students experienced less forgetting than the ESL students for both the unknown words and the partially known words a week later.

Table 25

Means and Standard Deviations on Productive (L1 to L2) Translation Test

	EFL				ESL			
	Reading		Writing		Reading		Writing	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Pre								
UW	0	0	0	0	0	0	0	0
KW	0.06	0.14	0.15	0.25	0.17	0.23	0.10	0.17
Post1								
UW	4.00	2.11	0.79	1.48	2.36	1.56	1.47	1.60
KW	4.17	2.04	1.88	1.68	3.39	1.79	2.08	1.56
Post2								
UW	1.08	1.39	.024	0.44	0.22	0.39	0.11	0.47
KW	1.99	1.67	1.19	1.13	0.65	0.88	0.40	0.45

Note. UW = Unknown words, KW = Known words. Pre = Pre-tests, Post1 = Immediate posttests, Post2 = Delayed posttests. Maximum score = 8.

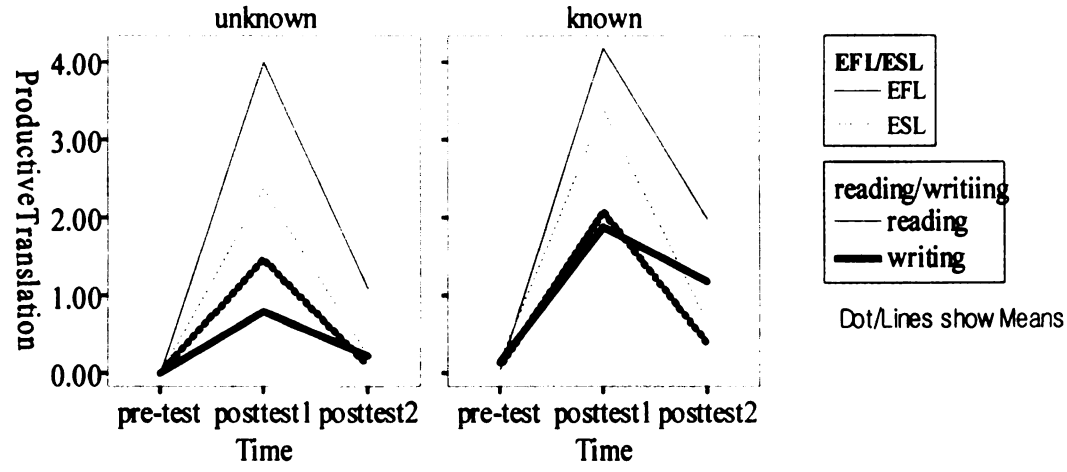


Figure 14. Comparison of means among EFL reading, EFL writing, ESL reading, and ESL writing on the Productive (L1 to L2) Translation Test.

The results of the MANOVA revealed a significant main effect for knowledge, $F(1, 402) = 19.354, p < .001, \eta^2 = .046$, where known words showed significantly higher scores than the unknown words. There were also main effects for time, $F(1, 402) = 170.026, p < .001, \eta^2 = .458$; context, $F(1, 402) = 11.518, p < .001, \eta^2 = .028$, and for treatment, $F(1, 402) = 51.236, p < .001, \eta^2 = .113$. However, these were qualified by two-way interactions between time and treatment, $F(2, 402) = 26.255, p < .001, \eta^2 = .116$, between time and context, $F(2, 402) = 4.128, p < .05, \eta^2 = .020$, and between context and treatment, $F(2, 402) = 10.696, p < .01, \eta^2 = .026$. Furthermore, the two-way interactions were qualified by a three-way interaction among time, context and treatment, $F(2, 402) = 4.958, p < .01, \eta^2 = .024$.

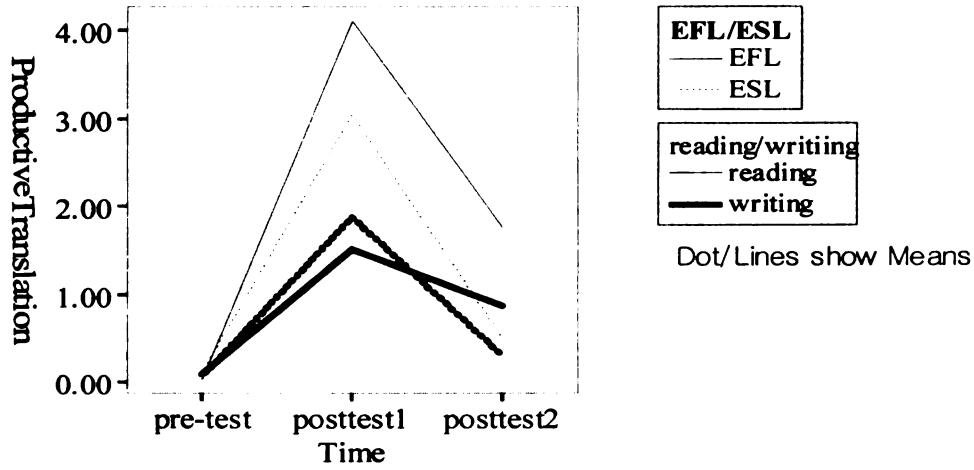


Figure 15. Interactions between treatment, context and time on the Productive (L1 to L2) Translation Test.

Figure 15 illustrates the three-way interaction between time, context and treatment. In order to investigate the interaction, post hoc paired samples *t*-tests were conducted for the pre-test vs. Posttest 1, the pre-test vs. Posttest 2, and Posttest 1 vs. Posttest 2. Table 26 shows the results from the tests. Significant differences were found in each time interval across all the groups being compared (i.e., the EFL reading and writing groups, and the ESL reading and writing groups). These results suggest that there were significant lexical gains in Posttests 1 and 2 among all the groups, but the gains decayed significantly one week later. In addition, the effect sizes were different depending on the learning context and treatment. For the time interval between the pre-test and Posttest 1, the largest effect size was found for the EFL reading group and the smallest for the EFL writing group, suggesting that the EFL reading group gained most and the EFL writing group gained least. For the time interval between the pre-test and Posttest 2, the largest effect size was found in the EFL reading group and the smallest was found in the ESL

Table 26

Paired Samples t-Tests for Time Intervals in the Reading and Writing Groups (Productive Translation Test)

	Reading	Writing
	EFL	
Pre - P1	$t(17) = -8.674, p < .001, d = 2.879$[a]	$t(16) = -4.030, p < .01, d = 1.280$[a]
Pre - P2	$t(17) = -4.905, p < .001, d = 1.601$[b]	$t(16) = -4.097, p < .01, d = 1.241$[b]
P1 - P2	$t(17) = 7.405, p < .001, d = 1.388$[c]	$t(16) = 2.120, p = .05, d = .509$[d]
	ESL	
Pre - P1	$t(17) = -8.292, p < .001, d = 2.680$[a]	$t(17) = -5.371, p < .001, d = 1.722$[a]
Pre - P2	$t(17) = -3.045, p < .01, d = .872$[b]	$t(17) = -2.628, p < .05, d = .824$[b]
P1 - P2	$t(17) = 8.475, p < .001, d = 2.156$[c]	$t(17) = 4.940, p < .001, d = 1.447$[c]

Note. Pre - P1 = Pre-test and Posttest 1; Pre - P2 = Pre-test and Posttest 2; P1 - P2 = Posttest 1 and Posttest 2. [a]Significant difference between the pre-test and Posttest 1 was found. [b]Significant difference between the pre-test and Posttest 2 was found. [c]Significant difference between the Posttest 1 and Posttest 2 was found. [d]The effect size was smallest on this test.

writing group, indicating that the EFL reading group gained most and the ESL writing group gained least in Posttests 1 and 2. For the time interval between Posttest 1 and Posttest 2, the largest effect size was found in the ESL reading group, and the smallest size in the EFL writing group, revealing that the EFL writing group forgot the least among the groups.

In order to test the differential effect of the treatment in each context, post hoc *t*-tests were conducted for the reading and writing groups in each learning context. In the pre-test, no difference between the reading and the writing group was observed in either the EFL context ($t(33) = -1.328, p = .196, d = .462$) or the ESL context ($t(34) = 1.029, p = 0.831, d = .353$). In Posttest 1, the reading task showed significantly more facilitative effects than the writing task in both the EFL context($t(33) = 4.257, p < .001, d = 1.482$)

and the EFL context($t(34) = 2.312, p < .05, d = .793$), and the effect size was much greater for the EFL context than the ESL context. This result reveals that the EFL participants were more strongly affected by the different types of learning. In Posttest 2, the differential effect of the treatments disappeared in both the EFL ($t(33) = 1.993, p = .055$ $d = .694$) and the ESL contexts ($t(34) = 1.164, p = .253, d = .399$).

In addition, in order to test the relative strength of the learning contexts within each treatment, post hoc *t*-tests were conducted on the two contexts in each treatment group. In the pre-tests, no significant differences between the EFL and the ESL groups were found in either the reading group ($t(34) = -1.778, p = .084, d = .610$) or the writing group ($t(33) = .686, p = .498, d = .239$). In Posttest 1, similarly, no difference was found in either the reading group ($t(34) = 1.790, p = .082, d = .614$) or the writing group ($t(33) = -.699, p = .489, d = .243$). In Posttest 2, however, the EFL group performed significantly better than the ESL group in both the reading group ($t(34) = 3.153, p < .01, d = 1.081$) and in the writing group ($t(33) = 2.506, p < .05, d = .872$). These results illustrate that the relative strength of the reading task in the EFL and the writing task in ESL, which were observed in the mean scores, were not statistically significant. Instead, the result from Posttest 2 indicates that the EFL students forgot less than the ESL students a week later. In sum, the interaction between time, treatment, and context revealed that the EFL context and the writing task played a role in retaining the gains a week later.

Summary of the results

Both the reading and writing tasks showed differential effects on lexical gains and these effects interacted with other factors including learning context, initial knowledge, and time. The main findings were as follows;

1) In general, the reading task revealed more facilitative effects on lexical gains than the writing task on the form (L2) recognition, receptive (L2 to L1) and productive (L1 to L2) translation tests in Posttest 1. After one week, the reading task still revealed stronger effects on the receptive and productive translation tests, but the differences diminished due to more forgetting by the reading group. The writing task contributed as much as the reading task on the concept recognition tests in Posttest 1, suggesting that both the reading and writing tasks were equally effective for the concept recognition tests at both time intervals.

2) For the unknown words, the reading task resulted in better gains and retention than the writing task, which is evidenced by superior performance on the form (L2) recognition, receptive translation (L2 to L1) and productive translation (L1 to L2) tests in Posttest 1 and on both translation tests in Posttest 2. For the partially known words, the writing task did not result in larger gains than the reading task, except on the concept recognition test in Posttest 1, on which the writing task showed higher scores than the reading group. In addition, for the partially known words, the writing group showed significantly improved scores on the form recognition test at both time intervals, which suggests that the writing task might have a potential benefit on the partially known words.

3) The EFL and ESL learning contexts similarly revealed the more facilitative effects of the reading task on the receptive and the productive translation tests in Posttest 1. In the EFL context, the reading task showed more beneficial effects on the form (L2) recognition test, receptive (L2 to L1) translation, and productive (L1 to L2) translation tests in Posttest 1, and on the receptive (L2 to L1) translation test in Posttest 2. These findings suggest that differential effects of reading and writing tasks might not be

dependent on learning context. However, the effect sizes were larger for the EFL context than the ESL context. Additionally, the reading groups' stronger effect was shown more frequently in the EFL context than the ESL context, revealing that the EFL students were more strongly affected by the different types of learning. Furthermore, in Posttest 2, the EFL student showed less forgetting than the ESL students on the receptive and the productive translation tests; a statistically significant difference between the EFL and the ESL context was observed on the productive translation test in Posttest 2. This result suggests that learning contexts might play a role in retention regardless of the different types of learning.

When the learning contexts were compared within each treatment group, the EFL reading group performed better than the ESL reading group, while the ESL writing group performed better than the EFL writing group in Posttest 1. Even though these differences were statistically non-significant in most of the measurements, the superior performance of the EFL reading group to the ESL reading was found on the productive translation test (Posttest 2), and superior performance of the ESL writing group to the EFL writing group was found on the concept recognition test (Posttest 1).[4]

[4]The EFL reading group's scores were higher than the ESL on the productive translation test in Posttest 2, ($t(34) = 3.153$, $p < .01$, $d = 1.081$) and showed a trend on the form recognition test in Posttest 1, ($t(34) = 1.979$, $p = .056$, $d = .678$). The ESL writing group showed higher scores than the EFL writing group on the concept recognition test ($t(33) = -2.292$, $p < .01$, $d = .797$), and showed a trend on the receptive translation test ($t(33) = -1.793$, $p = .082$, $d = .624$).

Discussion

The present study addressed the effects of receptive (reading) and productive (writing) tasks on lexical knowledge development, and explored how such tasks interacted with intervening factors, such as learning context, level of prior knowledge, and time. The first research question examined which task types resulted in better gains and retention of new lexical items. The second and third research questions concerned how the two tasks might differentially affect gains when considering the initial level of knowledge about the words that were to be learned. These questions investigated whether or not productive tasks would be more beneficial for increasing knowledge about partially known words, and whether or not receptive tasks would be better for increasing knowledge about unknown words. The fourth question explored the effects of different learning contexts (ESL vs. EFL) on lexical gains under different treatment conditions. With reference to the research questions that guided the current study, the main findings are discussed below.

Effects of Receptive and Productive Tasks on Lexical Learning

The results of this study indicated that both treatments significantly contributed to vocabulary knowledge development, but that reading tasks were more beneficial for acquiring both receptive and productive knowledge when an equivalent amount of time was allotted for completing the tasks. This finding is supported by significant facilitative effects observed immediately after the treatment for the reading condition on three of the four measures: the form recognition, receptive (L2 to L1) translation, and productive (L1 to L2) translation tests. In addition, this finding was maintained one week later on both the receptive and productive translation tests, which were considered more difficult of the

four measures; however, the stronger effects of the reading task was observed to a lesser extent, due to considerable forgetting by the reading group. In contrast, the smaller gains initially observed by the writing group were not forgotten as much as in the reading group, illustrating more maintenance of new knowledge, and less forgetting of the words learned in this condition. The writing tasks contributed to lexical gains as well, but the gains observed from this condition were not comparable to those obtained by the reading group on the three measures except for the concept translation test in which the writing group performed equally as well as the reading group.

The more beneficial effects of receptive tasks (reading) are consistent with the findings from previous studies (Barcroft, 2004b; Webb, 2005). Webb found that receptive tasks (reading) were more effective for acquiring both receptive and productive knowledge than productive tasks (writing) when same amount of time was allotted to the tasks. The current finding also corroborates the findings obtained by Barcroft (2004b) who demonstrated that writing tasks (writing sentences) were not as effective as non-writing task (such as visually processing new words) in promoting gains in productive word knowledge. The present study's results expand Barcroft's (2004b) finding to other aspects of knowledge including recognition and receptive translation, as well as productive translation.[5]

As for offering an explanation for the receptive condition (i.e., the reading task)'s better performance for both receptive and productive knowledge gains, Webb (2005) previously explained this in terms of time on task. That is, the reading group had an

[5]In Barcroft (2004b), writing tasks (writing sentences) revealed inferior effects to non-writing tasks (seeing words on the screen) on acquiring productive knowledge (free recall in L2 to picture cue) when same amount of time was allotted. The current experiment expands this finding to other aspects of knowledge, including knowledge concerning recognition and receptive translation as well as productive translation.

ample amount of time to process the input more deeply, or to use alternative strategies, due to less time needed for reading, while the writing group needed more time for completing the writing task. However, this explanation is not tenable for the current study because the length of the sentences in the reading condition was adjusted to be longer than those used in Webb (2005) in order to increase the time needed to complete the receptive task. In addition, due to the presence of longer sentences, it was assumed that participants would have to divide their attentional resources between processing the sentences and the individual words within the sentences. Therefore, there is little possibility that the reading group benefited merely from having extra time on the task.

One alternative reason for the less beneficial effect of writing can be explained in terms of the negative role of forced output at the initial stage of learning. Barcroft (2004b) suggested that forcing output could inhibit learners' ability to encode and retain new word forms, because forced output during the initial stages of learning exhausts processing resources. He drew upon Wickens's (1984, 1989, cited in Barcroft, 2004b) predictions that divided attention during time-sharing activities can hamper learner performance given learners' limited processing capacities. According to Barcroft (2004b), when new L2 words are presented to learners, they must allocate processing resources to complete dual tasks: encoding new L2 word forms as well as encoding form-meaning mapping. The mental effort required for the simultaneous completion of these two processing operations during forced output tasks can exhaust learners' processing resources, resulting in decreased rates of learning. In addition, this finding was obtained in VanPatten's (1990) study on attention to form and meaning. In the study, he suggested that learners have difficulty in attending to both form and content at the same time.

Second, the current finding, the more facilitative effects of reading on lexical gains, supports the role of providing comprehensible input through meaningful contexts. First of all, all participants demonstrated at least 99.09 % of knowledge of the vocabulary contained within the reading treatment sentences, as measured by the sight vocabulary test. This coverage rate met the condition for successful reading in previous studies (see Waring & Nation, 2004). Next, the reading treatment provided three sentence contexts per target word with a gloss, while the writing group was given only single target words that were glossed, but without context. Technically speaking, there was more input processing required during the reading treatment compared to the writing treatment due to the rich and comprehensible input provided by reading. Consequently, the increased processing opportunities might have facilitated lexical gains in the reading task. Previous studies have shown that providing context had a facilitative effect on lexical gains (Melka, 1997; Paribakht & Wesche, 1997, 1999). For example, by comparing context vs. no context conditions, Van Koppen (1987, cited in Melka, 1997) showed that context had a facilitative effect on receptive and productive lexical gains of university students. In addition, Paribakht and Wesche (1997, 1999) suggested that richness of information in the given context enabled readers to verify and elaborate information about new lexical items, thus resulting in improved learning. They pointed out that "varied and meaningful contexts of use that furnished indicators of their meanings and of their lexico-semantic-syntactic relationships facilitated lexical learning" (1999, p. 196).

Third, participants in the reading condition were likely aided by the increased number of repetitions of the target words presented through three sentences while the writing group experienced only one exposure to the target words. Paribakht and Wesche

(1999) pointed out that redundant exposure to target words facilitated lexical learning. Moreover, the current result supports Rott's (1999) study that explored the effect of frequency of exposure through reading. Rott found that repeated exposure yielded higher gains and retentions of university students, who were studying German as a foreign language.

Fourth, the reading group in the current study might have been able to focus on formal features of the target words to a greater extent because their attention was not divided into conceptualizing, producing, and monitoring production as it would have been for the writing treatment group. Although the receptive task group had much more information to process, compared to the productive task group, the type of processing during the receptive task was assumed to be more similar in nature (e.g., processing and evaluating input) than the processing required of the writing task group. In other words, the reading might have required only processing and evaluating input, while the writing task might have required greater amounts of different types processing, which included both semantic and structural elaboration as well as meta-cognitive strategies such as planning and monitoring. These combined processes involved in the writing task likely required and consumed more attentional resources than the operations required within the reading condition.

However, the present findings are not consistent with the predictions by the word-pair studies, which suggested that receptive tasks yield more gains in receptive knowledge whereas productive tasks result in more gains in productive knowledge (e.g., Griffin & Harley, 1996; Schneider et al., 2002; Stoddard, 1929; Waring, 1997). However, in the word pair studies, the distinction between receptive and productive tasks, or

receptive and productive tests was made in the order of presentation of the word pairs: L1 to L2 or L2 to L1. Thus, it is not surprising to find more benefits in the equivalence between the learning types and tests types. Accordingly, the findings from the word pair studies should not be interpreted as receptive and productive task effects on receptive and productive knowledge gains as interpreted in previous studies (Mondria & Wiersma, 2004; Webb, 2005).

The present study's results do not support the predictions made by *the Theory of Involvement Load* (Hulstijn & Laufer, 2001), which suggested that productive tasks facilitate lexical gains to a greater extent than receptive tasks. Two important factors, the time and the design of the writing task, appear to account for the result. In the study testing the theory of involvement load, Hulstijn and Laufer assumed that time on task is an inherent property of a task. They provided more time for the writing tasks than for the reading task; the time allotted for each task was 40-45 minutes for the reading condition, 50-55 minutes for the reading and comprehension question condition, and 70-80 minutes for the writing condition. As acknowledged in their study, the different time allotted for each task is likely to affect the results. In addition, the writing task in the study was in fact a combination of reading and writing; the participants were asked to write an original sentence after reading an example sentence for each target word. The combination of reading and writing involved in the writing task might have yielded more beneficial effects on immediate gains and retention one week later.

Effect of Receptive and Productive Tasks on Forgetting

The stronger effect of the reading task was maintained in the delayed tests as well. However, the reading groups' scores decreased dramatically while the writing groups'

scores declined moderately. In other words, although there was still more learned in the end from the reading task because the gains of the reading group were initially higher, the reading group's gains faded more markedly than those of the writing group. This finding was evidenced by the higher rate of forgetting in the reading group when the scores between the immediate posttest and the delayed posttest are compared. On the one hand, the reading task resulted in higher gains on the immediate test; on the other hand, the gains were not as stable (i.e., long lasting) as those from the writing task. This finding is in line with Schneider et al. (2002)'s study, which is one of word pair studies reporting that receptive learning led to more forgetting between immediate tests and delayed tests than productive learning.

The current results correspond to the claims in previous studies that initial difficulty in production leads to better long-term retention of lexical knowledge (Mondria & Wiersma, 2004; Waring, 1997). Moreover, according to Paribakht and Wesche (1999), "if the meaning is not to fade quickly from the learners' working memory, some deeper level of mental effort appears to be necessary" (p. 215). Thus, it is possible that the reading task provides rich information but does not induce as much mental effort as the writing task. The writing group may be involved in more varied processes; for example, they may invest more mental effort to generate a meaningful sentence by activating conceptual knowledge, and then apply meta-cognitive strategies of planning and monitoring because they were not provided any context for the target words. This extra mental effort involved in the writing task seems to lead to stronger retention over time even though this effort did not result in initial gains comparable to those of the reading task. Alternatively, there may have been too many words to be remembered from the

reading task and the burden on memory would then be increased compared to the writing task where there were fewer words to process.

Judging from these findings mentioned above, the writing task appears to induce different types of processing than the reading task. According to Craik and Tulving's (1975) *Depth of Processing* explanation, retention is dependent on the level at which information is processed; the meaning of a new word is processed at a deeper level, while a phonological form is processed at a shallow level. In addition, Laufer and Hulsltijn (2001) emphasized that the amount and quality of learner's attention in processing a new lexical items determine the degree of retention. Thus, it seems that the processing in productive tasks occurs at a deeper level than receptive tasks, because new information is associated with pre-existing knowledge (i.e., L1 concept) and integrated within the pre-existing knowledge when completing productive tasks. By contrast, the processing in receptive tasks appears to be more superficial, which is more likely to fade over time if further exposure is absent, despite strong imprint of memory traces from comprehensible input in the short-term memory. Alternatively, it seems that the more that is quickly learned, the more that can fade easily without repeated exposures and further processing.

Effect of Initial Levels of Word Knowledge on Gains Under the Different Task Conditions

The current study hypothesizes that the writing task would be more facilitative for gaining and retaining knowledge for partially known words, based on Barcroft's (2002, 2004b) prediction. The present study tested the prediction that the effect of semantic elaboration involved in writing tasks depends on whether the target words are known words or unknown words, and increased semantic processing in writing tasks might facilitate the ability to remember known words. Levels of word knowledge in the present

study were accounted for by using nonsense words, by priming learners on some of the target words prior to the treatment, and by verifying through the pre-tests that some degree of knowledge was gained (e.g., form recognition). Contrary to Barcroft's predictions, the productive (writing) task did not show more facilitative effects on knowledge of the partially known words, except through one measure, the concept recognition test. This test assessed the ability to recognize the L1 concepts corresponding to each of the TWs as an initial stage of production. On this measure in Posttest 1, both task groups showed comparable gains for the unknown words, but the writing group showed slightly higher scores than the reading group for the partially known words. In addition, the writing task group showed significantly higher scores for partially known words than unknown words on the form recognition test while the reading group did not. Several possible explanations for these results are discussed below.

Initial word knowledge from the priming phase.

The present study intended to prime the different levels of prior knowledge (e.g., no knowledge, recognition, and receptive knowledge) about the target words, but it was only partially successful in the sense that the priming phase generated only an initial recognition of the word forms, but not receptive knowledge. One possible reason that the priming phase failed to prompt sufficient knowledge could be the nature of the "input processing" (Gass, 1988)[6] that occurred during this phase. In a study that investigated learners' strategy in inferencing, Paribakht and Wesche (1999) found that only half of the

[6]According to the input-processing framework (Gass, 1988), learners go through five major stages until they incorporate the new input data into their inter-language system after initial encounter with new L2 words. The five stages are as follows: 1) apperceived input -learners' noticing of new words and association with prior knowledge, 2) comprehended input - assignment of meaning to the incoming language data, 3) intake - assimilation of new language data which is limited by the level of analysis during initial comprehension, 4) integration - integrating of new data into learners' internalized second language system, and 5) output - active use of the new words, which aids conversion of further comprehended input to intake.

known words encountered in reading even reached the *apperceived input* stage, and still fewer had the potential to become *comprehended input*, let alone *intake*. They noted that "even under best of circumstances, when exact comprehension is achieved and learners do in fact retain new knowledge of the word form and its meaning, it is unlikely to go beyond recognition knowledge" (Paribakht & Wesche, 1999, p. 215). Similarly, Pulido (2004) showed that level of comprehension was related to intake and gains, but that few words were learned beyond the level of form or meaning recognition. In addition, the amount of exposure to the words was likely insufficient to promote greater levels of recognition (i.e., recognition of meaning). Paribakht and Wesche (1999) pointed out "intake and subsequent integration of new lexical knowledge normally require repeated input processing during multiple experiences with the words" (p. 198). Likewise, many studies have acknowledged that learning new words is a gradual process that is dependent on repeated exposure (Nagy, Herman, & Anderson, 1985; Paribakht & Wesche, 1997, 1999; Watanabe, 1997). Therefore, it is not surprising to find that the primed knowledge remained only at the recognition level due to the very limited number of encounters.

Another factor might be the tasks assigned to learners during the priming phase and the target words. The tasks provided for priming receptive knowledge (i.e., meaning) involved searching for a meaning and evaluating the meaning (see *Priming passages and questions* in *Material* section). These tasks were able to prime receptive knowledge about more than half of the target words at that moment, but did not result in retention. Participants' responses to priming questions in Passage 3, which intended to facilitate priming receptive knowledge, showed that more than half of the target words' meanings were correctly guessed, but those meanings were not retained one day after. This result

corresponds to a result found in Pulido (2007), which explored lexical inferencing through reading. This study found that participants' initial guesses of meaning were better than the retention of those meanings at a later time. In addition, Pulido (2007) showed that words that were more difficult to guess were not guessed, nor were they remembered as correctly as easier words. Presumably, some of the target words in Passage 3 were not easy to guess, thus resulted in less retention the next day, even though the priming passage provided clear semantic cues that enabled the readers to infer the meaning or other aspects of the nonsense words.

Effect of productive tasks on partially known words.

The present results did not support the hypothesis that productive (writing) tasks are more beneficial for learning partially known words than receptive (reading) tasks. In the current study, even though the writing task resulted in substantial gains on the measurements, the gains were not comparable to those of the reading group on the measurements, except on the concept recognition test. Barcroft (2002, 2004b) previously suggested that semantic elaboration in writing tasks facilitated performance on remembering known words, while the same treatment inhibited performance on remembering new words. However, it should be noted that the "known words" refer to a previously acquired language (i.e., L1) and "new words" refer to L2 words in his study (2002), which found that semantic elaboration involved in writing tasks resulted in better scores than other conditions on a free recall test. In this regard, the current study appears to support the effect of semantic elaboration on "known words" in Barcroft (2002) in the sense that the writing task showed scores comparable to or slightly higher than those of the reading task on the concept recognition test, which is similar to the free L1 recall tests

in Barcroft (2002).[7] The higher scores of the writing group on the concept recognition test corresponds with Jiang (2000)'s psycholinguistic model of L2 vocabulary acquisition, in which L2 learners rely on the L1 concept by copying the L1 lemma information into the L2 lexical entry at the initial stage of lexical learning. The current finding indicates that the writing task might be more effective for retrieving the L1 concept corresponding to the target words. Moreover, the connection of new words to the L1 concept that had existed in their mental lexicon can be strengthened over time.

Furthermore, the current results imply a possible effect of writing tasks on the partially known words on a few measurements. On the concept recognition test[8], the writing task resulted in slightly higher scores than the reading task for the partially known words, but did not for the unknown words. Moreover, on the form recognition test, only the writing task produced significantly higher scores for the partially known words, which was evidenced by significant differences between the unknown words and the partially known words. Even though the reading group showed better performance than the writing group on this test, the writing group's improved scores for the partially known words suggest a potential effect of writing tasks on partially known words. In addition, considering that the category of "partially known words" were based on the recognition tests' scores in the pre-test, this result implied that if the priming phase had succeed in prompting more advanced knowledge (e.g., meaning), there might have been a more facilitative role of writing tasks on known words.

In summary, with regard to the differential task effects on the unknown and

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[7] In the free recall test used in Barcroft (2002), participants were asked to recall as many of the English words (L1) as they could remember based on what they had seen in the previous phase.

[8] On the concept recognition test, for known words, the writing group outperformed the reading group, $t(69) = -2.684$, $p = .009$, $d = .646$, but did not for unknown words, $t(69) = -.975$, $p = .333$, $d = .234$.

partially known words, the reading task revealed more facilitative effects on lexical gains for unknown words. For partially known words, the writing task did not result in better gains than the reading task except through the concept recognition test, on which the writing task revealed a slightly higher score than the reading task. Few studies have examined the effect of productive tasks on words with different levels of partial knowledge, thus it is very difficult to compare these results with other studies. However, based on the predictions made by previous studies (Barcroft, 2002, 2004b) and the current findings, it would be possible to expect a positive effect from writing tasks on the partially known words if the partial knowledge goes beyond the 'recognition' level.

Effect of Receptive and Productive Tasks on EFL vs. ESL Learning Contexts

The current study provided generalizable evidence for the more beneficial effect of reading in both the EFL and ESL learning context. In both learning contexts,the reading task contributed more significantly to the gains than the writing task. However, there was a difference between the two learning contexts in terms of the extent of the gap between the reading and writing groups. The gaps between the reading and the writing groups were larger in the EFL context than in the ESL context for all tests. This finding can be interpreted in terms of the limitation of exposure to English in the EFL learning environment. Previous vocabulary studies with EFL participants suggested that there might be different patterns of performance and progress in EFL students compared to ESL students (Hulstijn & Laufer, 2001; Laufer et al., 2004; Laufer & Goldstein, 2004; Laufer & Paribakht, 1998). EFL students tended be exposed to English only in the classroom or through reading texts in English, while the ESL students were able to use English on a regular basis (Laufer et al., 2004). Therefore, the extent to which

participants were affected by the learning treatments might be expected to be greater in the EFL group, who relied primarily on classroom instruction for exposure to and practice with the foreign language.

Interestingly, when these two contexts were compared within each task, the EFL group was better than the ESL group in the reading task while the ESL group performed better than EFL in the writing task. This trend was observed in other measurements (see *Summary of the Results* in *Results* section), even though these tests did not show statically significant differences except on the productive translation test in Posttest 2. One explanation is that the EFL students might be more accustomed to learning words through reading, while the ESL students would be expected to be accustomed to learning words through a variety of modalities (e.g., listening, reading, writing, conversational interaction). This explanation is consistent with a study (Laufer & Goldstein, 2004), which tested the vocabulary size of EFL students. Laufer and Goldstein identified the main difference between EFL and ESL contexts as the different types of skills evaluated in school; EFL students are primarily evaluated on comprehension skills, whereas ESL students are expected to show spoken and written skills. However, this finding does not mean that the writing group was better than the reading group in the ESL contexts. Instead, this result demonstrates the relative strength of the EFL and ESL groups when they were compared within each task.

Furthermore, the EFL and ESL group demonstrated differences in retention: the EFL students tended to forget less than the ESL students. This finding was evidenced by better retention by the EFL group on both the receptive and productive translation tests. More specifically, the EFL writing group showed the greatest retention after one week. In

a study comparing vocabulary size between EFL and ESL students, Laufer and Paribakht (1998) suggested that EFL learners are more likely to invest more effort than ESL learners when they acquire a similar amount of passive (receptive) vocabulary. Moreover, it seems that the learning burden in tasks is more restrictive in the EFL context than the ESL contexts. In the ESL context, learners are more likely to be exposed to English all day, and have a lot of information to process and store from a variety of subject matters. In other words, the ESL groups' attentional resources are likely divided between different types of tasks. Consequently, learning new (nonsense) words that they'll never see again is likely to be more susceptible to forgetting compared to the EFL group, who is exposed to only a limited amount of input. For the reasons mentioned above, there might have been a greater amount of concentrated mental effort for the EFL context, which facilitated better retention.

Test Effects

The types of test can greatly affect the results one will obtain. In order to gain a more accurate and balanced picture of learning, this study adopted four types of tests. The recognition tests assessed familiarity with L2 form or L1 concept. The translation tests tapped into the ability to retrieve meaning or form as a basic component of receptive and productive knowledge. Each test revealed different facets of lexical knowledge development, which include the incremental nature of word knowledge.

First, lexical knowledge, measured by four types of tests in the current study, did not appear to be an independent entity. In other words, the findings did not support the prediction that receptive knowledge is a byproduct of receptive learning or that productive knowledge is the outcome of productive learning, as implied in word pair

studies (e.g., Griffin & Harley, 1996; Mondria & Wiersma, 2004; Webb, 2005). Instead, they seem to be an interrelated construct because the reading task consistently resulted in better gains than the writing task for both receptive and productive knowledge. These consistent patterns of knowledge gains reflect an incremental aspect of lexical knowledge development, which is dependent on the degree and amount of processing of new information about a lexical item. Moreover, the scores from four types of tests were moderately or strongly correlated with each other, revealing that they were interconnected. Therefore, the present study partially provides empirical evidence for the theoretical concept of a lexical knowledge continuum.

Moreover, it seems that the lexical knowledge develops from recognition to different degrees of receptive to productive knowledge. This speculation is evidenced by the results that the recognition tests' scores were consistently higher than the translation tests scores, and the receptive test scores were consistently higher than the productive test scores. However, the current study did not show the difference between the concept recognition and the form recognition because both tests showed near maximum scores in Posttest 1 and these gains were remained without much loss in Posttest 2. Even though it is difficult to say decisively that receptive knowledge precedes productive knowledge, it is possible to postulate a hierarchy of difficulty on lexical knowledge development based on the current findings. Judging from the scores from the four types of tests, there seems to be three levels of knowledge demonstrated in the current study: a) knowledge needed in the productive translation test, b) knowledge needed in the receptive translation test, and c) knowledge needed in the L1 concept or in the L2 form recognition tests. This finding is consistent with Laufer et al. (2004), which suggested the hierarchy of difficulty

in four types of test modalities: passive and active recognitions, passive (L2 to L1) and active (L1 to L2) translation. They concluded that active recall (i.e, productive translation) is more difficult than passive recall (i.e., receptive translation), which are followed by active and passive recognition respectively, but there is not much distinction between the recognition tests. Even though the recognition tests in the current study were in rather different formats from those used in their study,[9] the current results showed that there is a hierarchy of difficulty in lexical knowledge.

Regarding the difference between receptive and productive knowledge, the current study showed that receptive knowledge is larger and easier to obtain than productive knowledge. This finding is consistent with the findings of previous studies (Griffin & Harley, 1996; Mondria & Wiersma, 2004, Stoddard, 1929; Waring, 1997). However, the receptive scores did not exceed productive scores to the extent reported in Stoddard (1929), in which receptive score was twice as large as the productive scores. In addition, receptive knowledge is less susceptible to decay than productive knowledge in the current study regardless of learning types. This finding supports Waring (1997), which suggested that productive knowledge is more elusive, more difficult to learn, and possibly more fragile. One reason for this is that if we know a word productively, more about the word has to be learned, and "all this extra information needed to be learned could render the learning more fragile than receptive learning as mental resources could be stretched thinner due to the volume of knowledge need to be retained" (Waring, 1997, p. 5). In addition, Barcroft, (2004b) explained the difficulty of gaining productive knowledge,

[9]The passive recognition test was to choose the target word which matches the definition from four options; the active recognition tests was to choose the meaning of the target word from the four options. The active recall test was to supply the L2 word starting with a given letter, and the passive recall was to demonstrate understanding of the meaning of the L2 word in a sentence by completing the sentence with an acceptable response.

"...in receptive tests, when new word forms are provided for the learners, learners exhibit their ability to connect word forms with their referent, but in the productive tests, they have to generate word forms on their own (p. 330)".

Pedagogical Implications and Limitations

Pedagogical Implications

Given that forced output such as sentence writing has a strong inhibitory effect on L2 vocabulary learning, teachers need to limit forced output during the initial stage of learning new words. Instead, the findings here indicate that it would be recommendable to provide comprehensible input within meaningful contexts. This does not mean that output is not beneficial, but rather that the optimal time for forcing output should be taken into account. At the initial stage of learning words, assuming the same amount of time is given to complete the tasks, providing rich and meaningful input would be more beneficial for L2 learners than forcing output.

Teachers should also be aware of limits on learners' capability to process new information, and should allow learners enough time to process the new words as a necessary first step before production (Barcroft, 2004a). Before learners are able to use target words, they need to process the new words as input in one way or another (Barcroft, 2004a). Therefore, it seems necessary for teachers to provide sufficient time and opportunity to process input for students. This would include not providing overly challenging tasks at the initial stage of learning.

Third, even though this study provided insufficient evidence for writing effect on partially known words, considering that there was a potential benefit of writing tasks on partially known words, teachers could decide the optimal point to implement the different types of tasks based on the learners' learning stages. Reading tasks appear to be suitable for introducing words that were unknown to learners at the initial stage. Writing tasks could be implemented at a later stage for already introduced words or the word that

students could not produce in writing even though they know the meaning. In addition, writing tasks might be an effective way to wrap up a lesson or whole chapter. Alternatively, teachers could provide instructional help by suggesting the best learning strategy based on students' particular stage of learning.

The study findings further indicate that optimal conditions for learning might be dependent on the learning context. The current study showed that the students in EFL contexts were more strongly affected by the type of learning than the ESL students who were affected by the learning types to a lesser extent. Thus, teachers in EFL contexts may need to be more aware of assigning appropriate tasks than their ESL counter parts.

Finally, teachers should keep in mind that word knowledge is incrementally developed with multi-dimensional aspects. As far as words are concerned, we should not expect instruction to lead to observable gains at the end of an individual class. Even though the learners might forget most of the words, the initial exposure may, nonetheless, leave a trace in learners' memory as partial knowledge, which might be used as scaffolding for learning at the next encounter. Therefore, teachers should provide as much input as possible from various sources whenever they can. In addition, the current results showed productive knowledge can easily decay over time even though learners were able to produce a word. Consequently, we should not expect that learners *know* the word even if they succeed in producing the words at the moment. Furthermore, the current results showed that the words presented at the priming stage obviously revealed more noticeable gains than those not presented. Accordingly, it is more important to present words repeatedly in class. Repeated exposure, which might be more effective with additional tasks, is needed to maintain the knowledge. Of particular pedagogical

significance is the finding that the reading tasks showed a noticeable decline in retention when the delayed tests were given, despite the remarkable performance on the immediate tests. Thus, repetition seems to be especially important for reading tasks to refresh the memory and integrate the information in the inter-language system.

Limitations

The current study has explored the differential effect of receptive and productive tasks on lexical knowledge development and various factors affecting the task effects including learning contexts and partial knowledge. Study limitations and directions for future study are suggested below.

First, the current study explored the research questions with only the same time condition. Many researchers claim that time is an inherent property of tasks because productive tasks usually require more time than receptive tasks (e.g., Hulstijn & Laufer, 2001), and believe that providing more time for productive condition reflects authentic learning (e.g., Webb, 2005). There were studies that administered two experiments in order to control time differently: providing the same time to both tasks in one experiment, and more time for writing in the other (e.g., Barcroft, 2004b; Webb, 2005). Arguably, time is an inherent element of task but there is still a need to measure the effect of task types in both time conditions in order to find results that are more conclusive.

Second, this study did not focus on certain specific variables including, *phonotactic regularity* (i.e., which means word is easy to pronounce) and *imagenability* (i.e., which means word is easy to create images for) (Henriksen, & Haastrup, 1998). Similarly, Barcroft (2002) listed a study (Ellis & Beaton, 1995) concerned with the effect of word features on lexical acquisition; the study found that longer words and L2 words that are a

less phonologically similar to L1 words were more difficult to learn. In the current study it seems that simpler words (e.g., words with smallest number of letters such as *sedal* or *tiser*) are typically both recognized and produced by participants, while only a small number of more difficult words (e.g., *trackle*) were recognized or produced. In addition, the part of speech, and non-romanic language learners' familiarity with the orthography of the target words, might affect gains and retention of words. These should be explored in a future study.

Third, the current study assessed only the basic level of word knowledge, which was the one-to-one relationship between form and meaning. Even though this study acknowledged that word knowledge involves more than just linking form and meanings, it possibly overlooked the importance of other types of word knowledge in vocabulary acquisition. Moreover, in the current study, the words were learned within contexts through reading and writing tasks but the gains were measured in decontextualized questions in the current study. If the words were assessed within contexts, there might be different results. Further studies need to measure other facets of knowledge besides spelling and meaning, and do within contexts in order to advance the understanding of vocabulary knowledge development.

Finally, most importantly, this study was not able to operationalize partial knowledge as intended, showing how it would be difficult to expect the outcome of word acquisition. The priming attempt in the current study can only be a first step to operationalize partial knowledge in research. In order to generate the different degrees of partial knowledge, other tasks should be devised. It would be difficult to operationalize the extent to which information is processed through a priming phase. However, tracing

partial knowledge is expected to provide a more accurate picture of lexical acquisition process. Further research should devise an optimal design to prompt the intended partial knowledge, which reveals how lexical knowledge progresses starting from initial recognition towards an advanced level of knowledge.

Appendix A

Target Words

Part of speech	Frequency of real words	Passage 1	Passage 2	Passage 3
Noun	_____	soreme	sedal	cader
	1K Word	(plan)	(bread)	(cot)
Noun	_____	febble	lesime	sarrope
	2K Word	(copy)	(cart)	(throat)
Noun	_____	plader	riggle	pistle
	OFF types	(password)	(aisle)	(temperature)
Noun	_____	tiser	vanor	resage
	OFF types	(professor)	(refrigerator)	(flu)
Noun	_____	trackle	piffant	tarrand
	OFF types	(override)	(magazine)	(exam room)
Noun	_____	grimer	fallary	lenile
	OFF types	(session)	(counter)	(pharmacy)
Verb	_____	romate	formit	traple
	1K Word	(to offer)	(to ring up)	(to explain)
Verb	_____	maptize	dospire	vermise
	2K Word	(to advise)	(to compare)	(to check in)

Note. Words in parenthesis represent the real words that were replaced for nonsense words.

Appendix B1

Priming Passage 2

Instruction 1-1: Please read this passage below. You have four minutes to read the passage. You may not turn to the next page until you hear the instructions. Please do not write anything on the page. Concentrate on all the words.

She realized that there was nothing to eat in the vanor, so she drove to the supermarket near her house. Soon she entered the supermarket and she got a lesime near the entrance. She began to walk through a riggle and went to the canned section. She decided to dospire the prices of the cans. Then she bought some sedal for breakfast and went to the vegetable stand to buy some grapes and potatoes. Because she felt tired, she decided to take a break for a minute. She sat down on a bench on the corner, and began to read a piffant. Afterward, she went to the fallary and placed everything there. When a clerk began to formit the prices, she realized that she hadn't brought her purse.

DO NOT TURN TO THE NEXT PAGE UNTIL YOU HEAR THE INSTRUCTIONS. YOU MAY NOT RETURN TO THIS PAGE AFTER YOU TUNR TO THE NEXT PAGE

Appendix B2

Priming Questions for Passage 2

Instruction 1-2: Please answer the questions below. You will have two minutes to answer the questions. You may not turn to the previous page.

words	Do you remember seeing the word in the passage?	Which category do you think this word belongs to?
vanor	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
lesime	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
riggle	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
dospire	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
sedal	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
piffant	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
fallary	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know
formit	Yes No	i) a characteristic or quality, ii).an action or state, iii) a person, place or thing, iv) I don't know

DO NOT TURN TO THE NEXT PAGE UNTIL YOU HEAR THE INSTRUCTION

Appendix C1

Priming Passage 3

Instruction 1-1: Please read this passage below and answer the questions. You have six minutes to read the passage. You may not turn to the next page until you hear the instructions. Please do not write anything on the page. Concentrate on all the words.

It was cold last night, and the heater in the room did not work. Jack had a fever and a sore sarrope the next morning. He thought that he had the resage, so he went to the clinic. He entered Doctor Smith's waiting room and went to vermise with the receptionist. Afterward, he sat down and glanced through some magazines. Soon after the nurse called him, Jack followed her to the tarrand to check his vital signs. Because of his high fever, the nurse took his body pistle first. Shortly afterward, the doctor came in and asked him to lie down on the cader for a closer examination. Later, the doctor gave Jack a prescription and began to traple to him that the syrup was for his cough. Next, Jack went directly to the lenile to buy his medicine. Finally, Jack left the clinic.

words	Translate the meaning into Korean
sarrope	
resage	
vermise	
tarrand	
pistle	
cader	
traple	
lenile	

DO NOT TURN TO THE NEXT PAGE UNTIL YOU HEAR THE INSTRUCTIONS

Appendix C2

Answers to Priming Device Passage 2

Instruction: Compare these answers with your own answers. How many words did you guess correctly? ( )

( ) **sarrope** : 목구멍, 인후

( ) **resage** : 감기

( ) **vermise** : 등록하다, 접수하다

( ) **tarrand** : 진료실

( ) **pistle** : 체온, 열

( ) **cader** : 간이 침대

( ) **traple** : 설명하다

( ) **lenile** : 약국

DO NOT TURN TO THE NEXT PAGE UNTIL YOU HEAR THE INSTRUCTIONS

Appendix D

Reading Task

Instructions: Try to learn the underlined words. Do not write anything on this page.

1) **soreme** (계획)
- Next week, world leaders will meet in New York to discuss a **soreme** to eliminate all chemical weapons around the world.
- They've devised a **soreme** to ease the flow of traffic downtown by constructing a new subway system.
- The company has a new **soreme** for reorganizing our department in near future.

2) **sedal** (빵)
- We don't charge extra for **sedal,** which is home-made and coffee during lunch time.
- Ruth passed Henry some brown **sedal** and butter while listening to his long story about hunting.
- David boiled the pot to make a cup of coffee and toasted a slice of **sedal** for his breakfast.

3) **cader** (간이 침대)
- Sue felt deep sorrow lying in a **cader** while a nurse washed her all over and patted her dry.
- The man sleeps in a small **cader**, which is at the corner of a very tiny cottage.
- Baby Sylvia was lying in her **cader** in the house while her mother was busy in the kitchen.

4) **febble** (복사)
- She loves to read the magazine and sometimes she lends a **febble** of the magazine to her friend.
- When buying by mail order, keep a **febble** of the details related to the company.
- As a result of new copyright laws, you should ask the office to send you a **febble** of the application.

5) **lesime** (손수레)
- He refuses to push a **lesime** to the shop because pushing the cart makes him feel unmanly.
- This fruit **lesime** is selling approximately equal numbers of three different fruits: bananas, pears and peaches.
- One day I saw a man pulling a small **lesime** which had small wheels, and inside it were small plants.

(6) **sarrope** (목구멍)
- The symptoms may last several days, usually starting with an irritating cough and a sore **sarrope.**
- If dishwasher detergents are accidentally swallowed, they cause terrible injuries to the **sarrope** and stomach.
- He stared down where his mother had fallen, and his **sarrope** and face seemed to swell up in a great sorrow.

(7) **plader** (비밀번호)
- You should look out for **plader** protection to prevent other unauthorized users from getting into the network.
- He is about to give the **plader** for the computer file which holds the final explanation
- The Director of Computer Services requires users not to access any computers under another user's **plader** to protect the data.

(8) **riggle** (통로)
- When turning a corner into the next **riggle** in the supermarket, I found the wine.
- The man sitting near me suddenly screamed, and rolled down the **riggle** to the front of the theater.
- They devised a system of entrances that help people to go up one **riggle** and down the next to avoid confusion.

PLEASE DO NOT TURN THE PAGE UNTIL YOU HEAR THE INSTRUCTIONS.

Instructions: Try to learn the underlined words. Do not write anything on this page.

(9) **pistle** (체온)
- In the evening, when the body **pistle** is beginning to fall, there is a natural tendency to fall asleep.
- Thousands of older people die each winter from cold conditions with a dangerously low **pistle.**
- She watched the patterns on the machines linked up to the baby, measuring his heartbeats and **pistle**.

(10) **tiser** (교수)
- Williams had difficulties establishing himself as a **tiser** at Cambridge and a leading British intellectual because of his uncertain relation to Marxism.
- He is proud that his son is a **tiser** who teaches English literature at the university.
- Nobody can draw attention to the scholastic relationship between a **tiser** and a student.

(11) **vanor** (냉장고)
- Store your cheese in a cool part of the **vanor** and remove it at least one hour before eating.
- Keep any ripe melons in a tightly closed plastic bag in your **vanor**.
- If you store the olives in a covered container in the **vanor**, they should last at least a week or two.

(12) **resage** (독감)
- The **resage** can spread very rapidly and is most likely to affect you in the autumn and winter.
- If you are one of those patients who are at greater risk for the **resage**, you should try to avoid catching it.
- Your doctor will normally be able to vaccinate you with a **resage** vaccine.

(13) **trackle** (추가등록)
- He had to ask for a **trackle** for taking the course which was already full a month ago.
- You need to get a **trackle** for the course as soon as possible because too many students were already enrolled to the course.
- Did you ask for a **trackle** for English literature with Prof. Lee ?

(14) **piffant** (잡지)
- In September's issue of *Good Food* **piffant,** you'll find lots of delicious recipes for this season's crops.
- She first saw *Dogs Today* on the newsstand, and read the **piffant** from cover to cover.
- The preview section of the **piffant** will show you what's going to be in the store in next month.

(15) **tarrand** (진료실)
- We waited, sitting on the long benches in the patients' waiting-room until the nurse called my name from the **tarrand**.
- She was nervous before entering the **tarrand** of the dentist, and ignored any of my attempts at conversation.
- When he was about to enter the **tarrand**, his dad came into the hospital.

(16) **grimer** (기간, 회기)
- Each training **grimer** should begin with 5 minutes stretching, and a 10 minutes running.
- Each **grimer** of the forum will be led by a few people representing the film industry.
- Many managers simply turn off the computer and go home at the end of a **grimer** without backing up their data.

PLEASE DO NOT TURN THE PAGE UNTIL YOU HEAR THE INSTRUCTIONS.

Instructions: Try to learn the underlined words. Do not write anything on this page.

(17) **fallary** (계산대)
- She had to waste time waiting at the **fallary** to pay for the food in the basket.
- Customers in Kmart are sometimes asked to give their zip codes at the **fallary** before paying for the bill.
- When Dennis got all the food to the **fallary**, he discovered that he did not have any money!

(18) **lenile** (약국)
- Edmund helped the priest to found a small **lenile** which provides free medicine to people.
- You can try one of the treatments which are available from the **lenile** without prescription.
- People are not going to go to the doctor because there won't be a **lenile** nearby to get a prescription.

(19) **romate** (제공하다)
- Since I was felt sorry for the beggar, I decided to **romate** him some food and clothes.
- Some schools **romate** a two-year course for students who have more experience in teaching.
- A gentleman called to ask for help with insects on his plants and Carole was able to **romate** some advice.

(20) **formit** (현금 등록기에 등록하다)
- Working in Supermarket, Sue is always careful not to **formit** the incorrect price for the items.
- You should **formit** the amount on the cash register, then record whether it is a check transaction or not.
- What Mike had to in the store was to **formit** less than the actual transaction to avoid the tax.

(21) **traple** (설명하다)
- I will **traple** the terms "open" and "closed" sides in a technique of TAEKWONDO.
- I'll tell you the whole truth, "I won't excuse or **traple** my conduct. I don't love you."
- It is important for you to talk with them about AIDS and to **traple** the important facts.

(22) **maptize** (조언하다)
- If you are seriously underweight, please visit a doctor who will **maptize** you about your diet.
- I have been given a beautiful plant, and I wonder if you could **maptize** me on how to look after it.
- You should find a lawyer to **maptize** you when a particularly large sum is involved.

(23) **dospire** (비교하다)
- We can see a difference between the two types when we **dospire** the two extreme forms.
- Women begin to **dospire** their lives with those of other male workers in America.
- When you **dospire** the alcohol contents of a wine and a beer, remember that the figures may not show the exact amount of alcohol.

(24) **vermise** (접수하다)
- When we entered the hospital, we started to **vermise** at the reception desk first and waited for a long time.
- If you **vermise** ten minutes before the departure of air plane, you can enjoy more relaxed hours.
- Travelers will want to **vermise** and check out quickly and get a good service in a hotel.

PLEASE DO NOT TURN THE PAGE UNTIL YOU HEAR THE INSTRUCTIONS.

Appendix E

Writing Task

Instructions: Please write a sentence with the given word and try to learn the given words.

(1) **soreme** (계획)

---

(2) **sedal** (빵)

---

(3) **cader** (간이 침대)

---

(4) **febble** (복사)

---

(5) **lesime** (손수레)

---

(6) **sarrope** (목구멍)

---

(7) **plader** (비밀번호)

---

(8) **riggle** (통로)

DID YOU WRITE A SETENCE FOR ALL OF THE WORDS?

PLEASE DO NOT TURN THE PAGE UNTIL YOU HEAR THE INSTRUCTIONS.

(9) **pistle** (체온)

---

(10) **tiser** (교수)

---

(11) **vanor** (냉장고)

---

(12) **resage** (독감)

---

(13) **trackle** (추가등록)

---

(14) **piffant** (잡지)

---

(15) **tarrand** (진료실)

---

(16) **grimer** (기간, 회기)

DID YOU WRITE A SETENCE FOR ALL OF THE WORDS?

PLEASE DO NOT TURN THE PAGE UNTIL YOU HEAR THE INSTRUCTIONS.

(17) **fallary** (계산대)

_____

(18) **lenile** (약국)

_____

(19) **romate** (제공하다)

_____

(20) **formit** (현금 등록기에 등록하다)

_____

(21) **traple** (설명하다)

_____

(22) **maptize** (조언하다)

_____

(23) **dospire** (비교하다)

_____

(24) **vermise** (접수하다)

_____

DID YOU WRITE A SETENCE FOR ALL OF THE WORDS?

PLEASE DO NOT TURN THE PAGE UNTIL YOU HEAR THE INSTRUCTIONS.

Appendix F

Sentence Sight Vocabulary Test

Instructions: Indicate whether or not you KNOW or UNDERSTAND these words by circling Yes or No.

1. Yes _____ No ____ Application	41. Yes _____ No ____ discuss
2. Yes _____ No ____ attempt	42. Yes _____ No ____ exact
3. Yes _____ No ____ bill	43. Yes _____ No ____ extra
4. Yes _____ No ____ company	44. Yes _____ No ____ extreme
5. Yes _____ No ____ condition	45. Yes _____ No ____ film
6. Yes _____ No ____ container	46. Yes _____ No ____ hunting
7. Yes _____ No ____ content	47. Yes _____ No ____ incorrect
8. Yes _____ No ____ department	48. Yes _____ No ____ insect
9. Yes _____ No ____ detail	49. Yes _____ No ____ lend
10. Yes _____ No ____ director	50. Yes _____ No ____ manager
11. Yes _____ No ____ experience	51. Yes _____ No ____ medicine
12. Yes _____ No ____ explanation	52. Yes _____ No ____ pattern
13. Yes _____ No ____ figure	53. Yes _____ No ____ priest
14. Yes _____ No ____ flow	54. Yes _____ No ____ proud
15. Yes _____ No ____ industry	55. Yes _____ No ____ push
16. Yes _____ No ____ measure	56. Yes _____ No ____ rapidly
17. Yes _____ No ____ particularly	57. Yes _____ No ____ ripe
18. Yes _____ No ____ plant	58. Yes _____ No ____ risk
19. Yes _____ No ____prevent	59. Yes _____ No ____ sore
20. Yes _____ No ____ protect	60. Yes _____ No ____ stomach
21. Yes _____ No ____ provide	61. Yes _____ No ____ stretching
22. Yes _____ No ____ relationship	62. Yes _____ No ____ swallow
23. Yes _____ No ____ representing	63. Yes _____ No ____ swell
24. Yes _____ No ____ seriously	64. Yes _____ No ____ tendency
25. Yes _____ No ____ tax	65. Yes _____ No ____ tightly
26. Yes _____ No ____ accidentally	66. Yes _____ No ____ treatments
27. Yes _____ No ____ advice	67. Yes _____ No ____ waste
28. Yes _____ No ____ asleep	68. Yes _____ No ____ weapon
29. Yes _____ No ____ attention	69. Yes _____ No ____ wheel
30. Yes _____ No ____ avoid	70. Yes _____ No ____ access
31. Yes _____ No ____ beggar	71. Yes _____ No ____ affect
32. Yes _____ No ____ boil	72. Yes _____ No ____ aids
33. Yes _____ No ____ cart	73. Yes _____ No ____ approximately
34. Yes _____ No ____ compare	74. Yes _____ No ____ available
35. Yes _____ No ____ confusion	75. Yes _____ No ____ chemical
36. Yes _____ No ____ conversation	76. Yes _____ No ____ code
37. Yes _____ No ____ cottage	77. Yes _____ No ____ computer
38. Yes _____ No ____ cough	78. Yes _____ No ____ conduct
39. Yes _____ No ____ crops	79. Yes _____ No ____ constructing
40. Yes _____ No ____ customers	80. Yes _____ No ____ eliminate

81. Yes _____ No _____ establishing
82. Yes _____ No _____ file
83. Yes _____ No _____ final
84. Yes _____ No _____ ignore
85. Yes _____ No _____ injury
86. Yes _____ No _____ instruction
87. Yes _____ No _____ involve
88. Yes _____ No _____ issue
89. Yes _____ No _____ item
90. Yes _____ No _____ link
91. Yes _____ No _____ network
92. Yes _____ No _____ normally
93. Yes _____ No _____ register
94. Yes _____ No _____ relax
95. Yes _____ No _____ remove
96. Yes _____ No _____ require
97. Yes _____ No _____ section
98. Yes _____ No _____ sum
99. Yes _____ No _____ copyright
100. Yes ____ No ____ delicious
101. Yes ____ No ____ departure
102. Yes ____ No ____ detergents
103. Yes ____ No ____ devise
104. Yes ____ No ____ dishwasher
105. Yes ____ No ____ enroll
106. Yes ____ No ____ forum
107. Yes ____ No ____ heartbeat
108. Yes ____ No ____ intellectual
109. Yes ____ No ____ irritating
110. Yes ____ No ____ magazine
111. Yes ____ No ____ Marxism
112. Yes ____ No ____ nervous
113. Yes ____ No ____ newsstand
114. Yes ____ No ____ patient
115. Yes ____ No ____ pat
116. Yes ____ No ____ prescription
117. Yes ____ No ____ preview
118. Yes ____ No ____ professor
119. Yes ____ No ____ reception
120. Yes ____ No ____ recipes
121. Yes ____ No ____ reorganizing
122. Yes ____ No ____ scholastic
123. Yes ____ No ____ scream
124. Yes ____ No ____ slice
125. Yes ____ No ____ sorrow
126. Yes ____ No ____ stare
127. Yes ____ No ____ subway
128. Yes ____ No _____ symptoms
129. Yes ____ No ____ theater
130. Yes ____ No ____ tiny
131. Yes ____ No ____ traffic
132. Yes ____ No ____ transaction
133. Yes ____ No ____ traveler
134. Yes _____ No ____ technique
135. Yes ____ No ____ unauthorized
136. Yes ____ No ____ underweight
137. Yes ____ No ____ unmanly
138. Yes ____ No ____ vaccinate
139. Yes ____ No ____ vaccine
140. Yes ____ No _____ zip-code

Appendix G

Form (L2) Recognition and Receptive (L2 to L1) Translation Tests

Instructions: Please indicate whether or not you saw the words on your tasks during session 2. If you think you saw the word, answer 'Yes', please translate the English words into Korean words. If you could not translate the word, provide any information that you remember.

1) vermise (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

2) vanor (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

3) pacon (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

4) traple (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

5) sarrope (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

6) tiser (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

7) tarrand (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

8) romate (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

9) sedal (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

10) trackle (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

11) riggle (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

12) denent (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

13) resage (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

14) sagod (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

15) soreme (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

16) pistle (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

17) hodet (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

18) piffant (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

19) formit (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

20) maptize (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

21) lesime (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

22) dospire (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

23) grimer (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

24) tasper (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

25) plader (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

26) febble (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

27) fallary (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

28) cader (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

29) lenile (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

30) cinow (1) Did this word appear in the writing task you did today? (Yes No)
(2) Translate this word into the Korean word ( ).

DID YOU ANSWER ALL OF THE QUESTIONS?
YOU MAY NOT RETURN TO THE PAGE ONCE YOU TURN TO THE NEXT.

Appendix H

Concept (L1) Recognition and Productive (L1 to L2) Translation Tests

Instructions: Please indicate whether you saw the words corresponding to Korean words on your tasks during session 2. If you think you saw the word, answer 'Yes', please translate the Korean words into English words. If you could not translate the word, provide any information that you remember.

1) 휠체어: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

2) 통로: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

3) 추가등록: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

4) 책: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

5) 제공하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

6) 약국: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

7) 손수레: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

8) 빵: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

9) 목구멍: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

10) 냉동식품: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

11) 기간, 회기: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

12) 교수: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

13) 계산하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

14) 계산대: (1) Did this word appear in the task you did today? (Yes No)

(2) Translate this word into the English word ( ).

15) 간이침대: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

16) 환자: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

17) 조언하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

18) 체온: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

19) 진료실: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

20) 접수하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

21) 잡지: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

22) 설명하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

23) 비밀번호: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

24) 비교하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

25) 복사: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

26) 변명하다: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

27) 독감: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

28) 냉장고: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

29) 고기: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

30) 계획: (1) Did this word appear in the task you did today? (Yes No)
(2) Translate this word into the English word ( ).

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