

Does Deeper Involvement in Lexical Input Processing during Reading Tasks Lead to Enhanced Incidental Vocabulary Gain?

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Abstract

This paper investigates whether increased learner involvement in search tasks during reading activities results in differential vocabulary acquisition in an incidental setting in line with Hulstijn and Laufer's (2001) Involvement Load Hypothesis. We designed and conducted an experiment with two groups of advanced Greek learners of English, an online dictionary-search group (Group 1) and a non-search group (Group 2) with the aim to test whether increased learner involvement in search tasks results in differential vocabulary retention. During a reading activity, participants of Group 1 were asked to find the meanings of 10 target words involved in the reading activity by using the online Google-dictionary and also find and write down a sentence relevant to the meaning of each target word. These two tasks were designed with the aim to activate the involvement factor "search" in line with Hulstijn and Laufer's (2001) three-factor Involvement Load construct. During the same reading activity, participants in Group 2 were simply given the meanings of the 10 target items on a separate sheet of paper (glossary). The experiment was conducted in two stages with one week's distance between them involving an immediate and a delayed vocabulary test aimed to assess short-term and long-term vocabulary retention respectively. The results of our study support the increased learner involvement hypothesis, as the dictionary-search group outperformed the non-search group in both tests.

Keywords

learner involvement, involvement factor "search", Involvement Load Hypothesis, incidental vocabulary gain, immediate retention, long-term retention

1. Introduction

In the last three decades several competing theoretical models drawing heavily on cognitive psychology have emerged aiming to explain vocabulary gain in second language acquisition and suggest ways for optimizing the processing, acquisition and long-term retention of lexical input. Cognitive theory of learning is more broadly concerned with how knowledge is acquired and integrated into the learners' cognitive system with a focus on the positive feedback relation between learning processes and the human cognitive infrastructure. It is precisely this causal relation between human cognitive processes and learning factors that affect acquisition at various levels (e.g., noticing, acquisition, retention, retrieval, etc.) as well as allow input to become intake that can be seen as the main focus of cognitive research into learning (Pavivic & Takac, 2008, p. 26).

Finding the most effective way to draw learners' attention to the target language so as to enhance performance and make the most of their linguistic resources has been granted prime importance in cognitive theories of learning (VanPatten & Benati, 2010, p. 71). Enhanced and twofold attention to the word's meaning and form throughout learners' exposure to input has also been considered as a fundamental prerequisite for better vocabulary retention and for new lexical information to proceed from working memory to the long-term semantic memory system (Gass, 1999; Martinez-Fernandez, 2008; Schmidt, 1990, 2000; Schmitt, 1997; VanPatten, 1993, 1996). Within this broader framework of cognitive theories of learning, Laufer and Hulstijn (2001) proposed their *Involvement Load Hypothesis*, which associates earlier suggestions on *depth of processing* (see Craik & Lockhart, 1972; Craik & Tulving, 1975) with the amount of elaboration needed in tasks-design so as to increase processing depth and optimize memory performance (Anderson & Reder, 1979, p. 390).

Inspired by the depth of processing model (Craik & Lockhart, 1972), Laufer and Hulstijn (2001) proposed a three-component or three-factor model (*need*, *search* and *evaluation*) that rendered Craik and Lockhart's somewhat vague notion of "depth" empirically tractable and measurable. More specifically, "*need*" concerns the learner's incentive to accomplish the task given and it is either moderate (1) or strong (2), depending on the vehicle imposing the task. More specifically, whether the learner is driven by external (extrinsic motivation) or personal impetus (intrinsic motivation) to accomplish a certain task in the second language (L2) determines the amount of attention to the work assigned and thus the result of the learning process. "*Search*" can also be moderate (1), strong (2) or even absent (0) according to the depth of processing. At this level, the learner notices the unknown second language (L2) word and is either given its equivalent meaning in the first language (L1) or is asked to look it up in the dictionary. It is at the search-level that the learner starts paying more attention to the novel vocabulary and greater processing effort is required. This factor allows for various degrees of manipulation of the input material via inferring, consulting a dictionary or glossing, etc., thus offering more possibilities for input to become intake and also bringing more cognitive factors and theories into play. The third component, i.e., "*evaluation*", involves comparing or combining the target word with other words, in order to reach the pragmatic competence to use it properly in context.

Similarly, evaluation can be moderate (1), or strong (2), depending on whether the learner has to make proper use of the word in context or recognize differences between words, or to relate old and new words together so as to produce an original utterance by using the unfamiliar word.

Now, the presence or absence of the three components of the Involvement Load Hypothesis accounts for deeper or shallower lexical processing, which in turn affects the degree of the learner's involvement in tasks, their subsequent attention to "a word's morphophonological, orthographic, prosodic, semantic and pragmatic features and to intraword and interword relations" (Hulstijn, 2001, p. 279) and ultimately, the retention of unfamiliar vocabulary. Laufer and Hulstijn's (2001) model, explored widely through empirical attestation (e.g., Sarani et al., 2013; Soleimani et al., 2015), could offer teachers varied possibilities for manipulating the input material in both qualitative terms (e.g., deep or shallow involvement) and quantitative ones (e.g., number of elaborations) in order to achieve optimal learning outcomes. The manipulation of these factors through appropriate tasks embraces a whole range of theories and task-induced involvement load models (Note 1) from input-based (e.g., Rassaei, 2012; Skehan, 1998; Schmitt, 2008) to output-based models (e.g., Salimi & Shams, 2016; Swain & Lapkin, 1995) combined with parallel accounts of individual motivation (Note 2).

The study presented in this paper investigates whether increased learner involvement in search tasks during reading activities results in differential vocabulary acquisition in an *incidental setting* (Note 3) in line with Hulstijn and Laufer's (2001) Involvement Load Hypothesis, but a diverse range of pertinent issues in incidental vocabulary learning will also be considered (e.g., the lexical processing framework and the efficiency of strategies with a focus on dictionary use). More specifically, this study explores the following two questions:

1. Do tasks which require higher levels of involvement (with a focus on "search" involvement) result in increased immediate retention of new receptive vocabulary?
2. Do tasks which require higher levels of involvement (with a focus on "search" involvement) result in increased long-term retention of new receptive vocabulary?

Our initial hypothesis is that higher levels of involvement (with a focus on "search" involvement) are directly associated with memory enhancement processes, hence resulting in both increased immediate retention of new receptive vocabulary as well as increased long-term retention of new receptive vocabulary, in line with pertinent empirical findings and research testing the involvement load hypothesis (see Barcroft, 2004; Fraser, 1999; Hulstijn & Laufer, 2001; Joe, 1998; Keating, 2008; Kim, 2008; Laufer, 2000, 2003; Laufer & Hulstijn, 2001; Laufer & Rozovski-Roitblat, 2011; Martinez-Fernandez, 2008; Pulido, 2009; Schmitt, 1997, 1998). The results of our study support the increased learner involvement hypothesis, since the increased involvement dictionary-search group outperformed the non-search group in both tests.

2. Methodology

To investigate our hypothesis we decided to opt for an experimental design that focuses only on the involvement factor “*search*”, which we take to concern both attention levels and levels of processing, thereby a) leading to memory enhancement during initial lexical acquisition and b) affecting long term vocabulary retention (Hulstijn & Laufer, 2001; Schmidt, 1990). Contrary to Hulstijn and Laufer’s (2001) pilot experiment where the “need” and “evaluation” involvement factors were activated, in our study we designed the tasks so that the motivational factor “need” as well as the cognitive factor “evaluation” to remain inactive for both the search task group and the control group, and thus be considered of (0) value.

Also, in line with Hulstijn and Laufer’s (2001) pilot design we decided to investigate differential vocabulary acquisition as a result of differential involvement in “search” in an incidental setting. The standard view of an incidental setting treats *incidental vocabulary learning* as a by-product of sub-attentive processes resulting from activities and tasks which are not explicitly geared towards the learning of new lexical items (e.g., Gass, 1999; Huckin & Coady, 1996; Hulstijn, 2001; Joe, 1998; Laufer, 2000, 2003; Schmidt, 1993; Wesche & Paribakht, 1999), in contrast to *intentional vocabulary learning* defined by VanPatten and Benati (2010) as explicitly geared towards the learning of lexical items in order to remember their meanings. Incidental vocabulary learning can be both implicit and explicit. In studies carried out in incidental settings learners are unaware that they will be given a follow up test on unfamiliar vocabulary. Hulstijn and Laufer (2001) view incidental vocabulary acquisition as a more appropriate experimental method to test their hypothesis rather than as a superior method of instruction.

We therefore designed and conducted an experiment with two groups of advanced Greek learners of English, a dictionary-search group (Group 1) and a non-search group (Group 2). During a reading activity, participants of Group 1 were asked to find the meanings of 10 target words involved in the reading activity by using the online Google-dictionary and also find and write down a sentence relevant to the meaning of each target word. These two tasks aimed at activating the involvement factor “search”. In the same reading activity, participants in Group 2 were simply given the meanings of the 10 target items on a separate sheet of paper (glossary). The experiment was conducted in 2 stages with one week’s distance between them, thereby involving an immediate and a delayed vocabulary test aimed to assess short-term and long-term vocabulary retention, respectively. The results of our study support the increased learner involvement hypothesis, since the dictionary-search group outperformed the non-search group in both tests.

Before running the experiment, much consideration was given to finding an appropriate text for the reading task in Stage 1. Initially we chose a text entitled “Teenagers” as the topic would be highly relevant to participants of this age group. The participants would feel more familiar with such a subject; in line with relevant research (Pulido, 2003; Hulstijn & Laufer, 2001), topic familiarity is one of the factors which determine vocabulary acquisition, since students find the text more relevant, allocate

more attention to it and thus enhance their memory performance. However, that would also contribute to an increase in the index of the factor “need”—leading to strong value (2) rather than moderate (1) which is the need of the participants to accomplish the tasks. In our case, however, it was important to keep the two other factors of Hulstijn and Laufer’s construct (“need” and “evaluation”) at low value and only increase “search” in the experimental group (Group 1) aiming at the strongest possible value: this was on the grounds that any value other than the lowest in the other two involvement factors would make it impossible to assess the contribution the “search” involvement factor made in the final result. More specifically, with varied values in “need” and “evaluation”—say, (2) for the former and (2) for the latter—we would be unable to decide to which extent these values might have contaminated the final outcome of the study in the experimental group (Group 1). In other words, we wanted to design the experiment in a way that “search” would feature as the sole parameter determining differential results. Hence, we opted for tasks that would keep “need” and “evaluation” at the lowest value. The text *Teenagers* was thus replaced with one that was less relevant to the students but still of general interest among current affairs issues, namely, a text chosen from *The Guardian Weekly* (2005, p. 17) about *Consumerism*. Similarly, the “evaluation” factor remained at value zero (0) since a production stage was not part of our experimental procedure—unlike Hulstijn and Laufer (2001), where the third task involved the production of a composition and thus “evaluation” value was strong (2). In our study the absence of such task was taken to amount to “evaluation” value (0).

Then, an extended search task was designed to allow for two levels of search and make the “search” factor stronger, i.e., value (2). In the first part, we asked Group 1 to search for the meaning of each word in the Google Dictionary and write it in the first language (L1). They were given the target words in a separate list and they had to complete the meanings next to the second language (L2) word. In the second part, they were asked to scroll down and find a sentence with the L2 word in question. This way participants see the word within an actual context of use and thus this combination of associative memory and the pragmatic ability can be said to make the “search” factor stronger, that is of value (2). The time needed to look up a word enables participants to elaborate deeper and notice the form as well as the meaning of the vocabulary in question by increasing *mental effort* as defined by Sperber and Wilson (1995). It is argued that when such noticing occurs, both short-term and long-term retention is strengthened (Gass, 1998). Moreover, it has long been argued that the quality of input processing as well as manipulation of levels of processing may determine word retention (e.g., in the foundational study by Craik & Lockhart, 1972, p. 273). Engaging learners in mental activities which demand more processing and attention augments the possibilities of learning the new words being encountered (Wesche & Paribakht, 2000). Actually, this deeper processing and the associations that accompany it, as more attention is called for, function as facilitators of new information to transfer from working memory to long-term memory (Craik & Tulving, 1975).

In the pilot design, at stage 2 of the experiment, a gap fill task had been initially devised with the target words given in random order for the participants to fill in. When designing the gap fill task, we decided

to use the 15 target words across different word classes, 3 adjectives, 4 verbs, 1 adverb, 1 collocation and 6 nouns. The rationale behind this decision was that the syntactic structure of the sentence indicates what word class the missing word belongs to. This meant that we increased the possibilities of participants' getting the word right by means of elimination and probabilistic thinking. This seemed a significant issue and thus we decided not to use the gap fill task.

At the same time, the purpose of this latter task would be to measure the long-term retention of the unknown words. However, such a measurement task differs from the measurement task employed in stage 1 in two ways. Firstly, it does not solely assess vocabulary retention but also the ability to contextualize this vocabulary. Secondly, failure to correctly fill-in a gap may as well be attributed to the participants' inability to comprehend the sentence in which the gap occurs rather than the participants not having retained the meaning of this particular item. It would be impossible to decide which of the two parameters might have played a part in the final result which again seemed to us as a weakness of the gap fill text. Hence, this task was rejected on the additional grounds that it might generate unexpected factors and thus weaken the evaluation of the findings of the experiment. Moreover, the probability of the participants' providing correct answers to the task by means of elimination, probabilistic thinking and chance was increased. To neutralize this setback, we decided that the fill-in task was inadequate for this particular purpose and opted for the vocabulary testing task we used in stage 1 which we simply duplicated in stage 2.

3. The Experimental Study

3.1 The Tasks

Our experiment employed two tasks. We designed the tasks so that, for both the task group and the control group, the motivational factor "need" would be of moderate value (1) and the cognitive factor evaluation would be inactive (0) value. So, in contrast to Hulstijn and Laufer's (2001) experiment where the "search" factor remained inactive, in our case, the "search" factor was activated and was the only involvement factor to significantly fluctuate, being of (2) value in the search task group and of (0) value in the control group. The activation of the "search" factor gave us the opportunity to investigate the effect of participants' deeper involvement in a task of looking the target words up in an electronic dictionary.

By keeping the other involvement factors at a low value we aimed to ensure that any differential results would be solely down to the parameter "search".

Search task group (group 1)		Control group (group 2)	
Need	1	Need	1
Search	2	Search	0
Evaluation	0	Evaluation	0

- Reading Task
- Search Task

- True/False Comprehension Questions Task
- Initial Vocabulary Test
- Delayed Vocabulary Test

3.2 Reading Materials

Two passages were initially selected for the experiment so as to enable the tutor to have an alternative choice in case the participants had prior knowledge and familiarity with one of the two texts to be used. One passage was about *Censorship* and the other was about *Consumerism*. We finally used the passage about *Consumerism* which we found in *The Guardian Weekly* (2005, p. 17) as the level of difficulty was considered more appropriate for the time during which the experiment would take place. It is 532 words long, 15 of which made up the target vocabulary.

3.3 Target Words

After a discussion with the tutor of the experimental class concerning the target words to be given to the participants, 15 words of both high and low-frequency were selected. First, we wanted to increase the probability that these lexical items were not known to the participants, and second, ensure that their number would be manageable so as to render incidental learning feasible for class time conditions.

At the same time, words of different classes (3 adjectives, 6 nouns, 1 adverb, 1 collocation and 4 verbs) were chosen so as to create more balanced bands, since not all types of lexical items and semantic categories are acquired using the same mental effort and requiring the same time of exposure. It is also important that the focus of our research is vocabulary acquisition in general and not its relation to particular types of semantic category. It is argued among researchers that certain lexical items and categories require more effort on behalf of the learners in order to be acquired. Pigada and Schmitt (2006), for instance, found that more exposure was needed for verbs rather than nouns for meaning intake. According to Paribakht and Wesche (1997), content-words such as nouns, verbs and adjectives are easier to acquire than function-words, such as articles and prepositions. In a case study conducted by Grabe and Stoller (1997) it was observed that a significant number of words were looked up in the dictionary because they were more difficult to acquire without being abstract or polysemous. Some sets of words appear to be more difficult to remember. Martinez-Fernandez (2008) conducted an experiment in line with the Involvement Load Hypothesis, examining the type of lexical item as well as the type of task. She selected abstract and concrete nouns and found that abstract nouns are more difficult to acquire than concrete nouns. Schmitt (2010) argues that certain sets of words are learned in a shorter time than others. Also, multiword phrases and collocations are more difficult to acquire incidentally (Huckin & Coady, 1999, p. 190).

3.4 Participants

The participants were 20 Year 1 undergraduate students between 19 and 24 years of age with Greek as their native language and were all advanced learners of English at New York College, Athens. The participants were randomly divided into two groups of 10, an experimental/search task group (dictionary group or group 1) and a control group (glosses group or group 2). He chose to work with

advanced learners because we wanted our experimental design to adapt to previous studies which argue that in order to achieve text comprehension at advanced level, the vocabulary knowledge required should be as high as 98% in the case of an ordinary text (Huckin & Coady, 1999; Laufer, 1997) and therefore, beginners would find it more difficult to infer the meanings of novel vocabulary items. We hence chose to test our hypothesis with learners who have already reached this threshold. Moreover, since this study focused on the activation of the “search” factor using a computer-assisted dictionary, we had to aim at learners who were familiar with the use of computer technology and in particular, online dictionaries (Hulstijn & Atkins, 1998; Laufer, 2000) and therefore, advanced learners were considered the most appropriate target group.

3.5 Dictionary Use

Our study increased the activation of the “search” factor in Group 1 by using an online dictionary. Dictionary use is argued among researchers to be a crucial lexical processing strategy in vocabulary learning (Fraser, 1997; 1999; Laufer, 2000, 2003). Nevertheless, it is argued that learners avoid using dictionaries as it is an activity they often dislike (Hulstijn & Atkins, 1998; Bogaards, 1995). For this reason, as well as due to time limitations, a computer assisted dictionary was chosen as a quicker way for the task to be accomplished. Electronic dictionaries are considered both easier and more convenient in their use than printed dictionaries (Chun & Plass, 1996; Laufer, 2000). Advanced learners today are familiar with the use of computers and preference for online over hard copy dictionaries is generally overtly displayed. Online dictionaries have the additional advantage of functioning as mediators for the learners’ further exposure to the Internet and to richer and natural second language input, making thus learning the second language a social experience (Note 4).

3.6 Experiment Procedure and Tests

The participants were given a consent form to sign and were also informed about the generic goal of the study and the procedure of phase 1 of the experiment. However, they were not informed about the vocabulary tests involved in phases 1 and 2, as that would prime their cognitive behavior during the experiment.

The experiment was divided into two stages, the first of which examined short-term memory and the second long-term memory. Both groups of participants i.e., the experimental group (group 1) and the control group (group 2) were involved in both stages. Each group was expected to complete the tasks without teacher engagement or support. That was in order to avoid other parameters affecting the result, e.g., the teacher’s personality or the participants’ learning style. In order to facilitate the process, the instructor dedicated the first 5 minutes giving the participants directions on how to complete the tasks in question.

3.6.1 Stage 1

Stage 1 was divided into 3 parts. Participants had only been informed about the first and the second part of the experiment; for incidental vocabulary acquisition to be adequately tested they should not be aware of the follow-up test in the third part.

a) Stage 1: Part 1

The participants of both groups were given a text to read, in which 15 words, that we had previously made sure were unknown to them, were highlighted in bold. The target vocabulary was given in bold so as to increase the salience of these lexical items and in turn the participants' attention. Such input enhancement techniques are considered crucial in incidental vocabulary learning in most current research. Laufer and Hill (2000), for example, used 12 highlighted target words in their experiment as attention devices. Kim (2003) also used typographical enhancement techniques and lexical elaboration and she found evidence that they promoted meaning recognition of L2 vocabulary from a reading task. In addition, as such techniques enhance the "noticing" factor, more possibilities arise for input to become intake and thus, for learners to internalize the target forms in their language system (Schmidt & Frota, 1986; Schmidt, 1993).

3 adjectives, 4 verbs, 1 adverb, 1 collocation and 6 nouns comprised the 15 target lexical items to be examined in the third part of stage 1 and in stage 2 in order to measure short and long-term retention of vocabulary respectively. As we noted earlier, we chose vocabulary across various semantic categories on the basis of research showing that different categories of lexical items have differential behavior in lexical acquisition and therefore a range of them would be required to get an all-round picture of vocabulary acquisition. In line with this, we used equal distribution of word classes to eliminate the possibility that the class of word use might affect the results of the study but also make word acquisition under incidental conditions feasible.

In order to engage Group 1 students in deeper involvement so as to render input more effective (Elis, Tanaka & Yamazaki, 1994) and increase the "search" factor at value (2), Group 1 was asked: a) to find the meanings of the 15 target words by filling in their meanings in the first language (L1) and b) copy out a sentence for each lexical item in the second language (L2) with the aid of the Google translator.

It was emphasized that participants should choose definitions relevant to the meanings of the words as they occurred in the text and ignore all irrelevant definitions. This would preclude the possibility of participants giving non text-based responses on the vocabulary test. This "double search task" involved participants of Group 1 in, first, finding the semantic meanings of the words in question and, second, in contextualizing the lexical items in question so as to render the "search" value stronger. 15 minutes were allowed for this task. The role of the instructor was to ensure that during these 15 minutes the participants would not be distracted by other irrelevant Internet sites and would only be engaged in the assigned task.

Group 2 was given the meanings of the target words from the outset in the first language (L1) on a different sheet of paper. By being given the target words, Group 2 participants had minimal to (0) "search" involvement during text comprehension. They simply made use of the given glossary/list with the meanings of the 15 target words whenever they needed to. Our hypothesis was that lesser learner involvement in "search" would result in lower retention of the target lexical items.

b) Stage 1: Part 2

After the reading task, the vocabulary worksheets were removed from both groups. This ensured that participants would not have further access to the meanings of the 15 target words and eliminated the possibility of any last-minute effort to memorize the target words. For incidental vocabulary acquisition to occur, learners should not make a conscious effort to learn the target lexical items (Schmidt, 1993). Then, each group was given a list of six True/False comprehension questions to answer. Upon completion of the tasks the answers were taken away from the participants.

We used the True/False comprehension questions task as a “distraction” technique. Our aim was to distract the participants’ attention away from the 15 words in bold. More specifically, the participants’ awareness that they were taking part in an experiment—which might involve some follow-up test—would most possibly be a strong bias in their cognitive behavior. The True/False comprehension questions were thus used to minimize the possibility that the participants would think about a vocabulary-related follow-up test and thus minimize the possibility of them making conscious effort to memorize the target vocabulary. Moreover, the 15 target words in the given passage were in bold. This fact was bound to act as an attention-catching element causing the participants to focus on them and intentionally single them out—despite their not knowing in what ways these words may be further relevant to them in the experimental process. In simple words, the 15 target words in the given passage being typed in bold might increase the probability of participants thinking that, in a subsequent stage of the experiment, they would be asked to do something in relation to these words. In an effort to minimize the accessibility of this assumption and distract attention away from the 15 lexical items we devised this particular distraction task. We also assumed that the time intervening between part 1 and part 3, due to their carrying out part 2, would give participants valuable information and “absorption” time allowing any initially acquired vocabulary to become truly accessible in episodic memory.

Additionally, both the choice of the 15 target words in bold and the comprehension questions were also designed to function as input enhancement techniques which are argued to promote second language learning (Combs, 2004). Our intention was that beyond the experiment itself there would be some pedagogical benefit for the subjects participating in it. These two choices raise the degree of consciousness and attention in both Group 1 and Group 2 and consequently both groups participants readiness to receive input without any potential interference in the differential outcome of the experimental hypothesis.

c) Stage 1: Part 3

The participants of both groups were then given an immediate test on the 15 target lexical items, i.e., a list with the 15 target words and were asked to note down their meanings in L1. The purpose of the test was to measure initial vocabulary acquisition/short-term vocabulary retention at quantitative level.

On completion of the above tasks, all materials were collected from the participants so as to make sure they would have no further involvement in the target vocabulary.

3.6.2 Stage 2

Stage 2 took place week after the completion of Stage 1 and was designed to measure long-term retention of the 15 target words we gave out at Stage 1 of the experiment, investigating any differential results in the search task group and the control group. One week after the completion of Stage 1, a list with the 15 target vocabulary items was given again to the same groups of participants and they were once more asked to note down their meanings in L1. The purpose of the test was to measure long-term vocabulary acquisition/long-term vocabulary retention at quantitative level. After careful reflection, we deliberately replicated the vocabulary test used in Stage 1. We considered this to be the most effective way of ensuring that any differential results would be solely down to differences in long-term vocabulary retention rather than differences that could well be attributed in the different nature of the test itself and the different cognitive demands it may impose on the participants (e.g., a fill in gaps test).

4. Results and Data Analysis

Because of the nature of the research hypothesis we have set out to investigate, we have opted for two separate t-tests instead of the alternative option of conducting a mixed ANOVA. The choice of doing the two separate t-tests results in missing the connection between the immediate and delayed data in terms of how they were paired in the performance of each individual participant. However, the purpose of this investigation is not to observe intra-individual differences in each participant but rather to focus on “volumes”, i.e., on differential results in the performance of whole groups in relation to the research questions under consideration.

The first independent sample t-test compares the dictionary search condition ($n = 10$) with the control condition ($n = 10$) only for immediate recall. The second t-test compares the dictionary search group ($n = 10$) with the control group ($n = 10$) for delayed recall. We report Mean recall and Standard Deviation for each condition.

In the immediate dictionary group the mean number of words recalled was: .61 (SD = .21). In the immediate control group the mean number of words recalled was: .30 (SD = .11). In the delayed dictionary search group the mean number of words recalled was: .4140 (SD = .19). In the delayed control group the mean number of words recalled was: .18 (SD = 0.06). Generally the Standard Deviation was quite low so the results can be interpreted with some confidence.

In both t-tests the homogeneity of variance assumption was found to be violated (immediate: $p = 0.04 < .05$, delayed Levene's test $p = 0.02 < .05$). Therefore, equality of variance was not assumed in the analysis. In terms of normality of distribution a Shapiro-Wilk test was employed (immediate dictionary search group: $p = .064$, immediate control group: $p = .001$; delayed dictionary search group: $p = .975$, delayed control group: $p = .052$).

The assumption of normality of distribution was violated in the immediate control condition but not in any other condition (immediate dictionary search group: $p = 0.06 > 0.05$, immediate control group: $p = 0.001 < 0.05$, delayed dictionary search group: $p = 0.98 > 0.05$, delayed control group: $p = 0.052 >$

0.05). Therefore, some caution is required in the interpretation of the results.

In the first t-test which makes a comparison between the immediate dictionary search group and the control group, the difference between the two conditions was found to be significant, $t(13.97) = 4.1$, $p = .001 < .05$. This result suggests that memory recall was superior in the dictionary search group than in the control group.

In the second t-test which compares the delayed dictionary search group and the control group it was found that $t(10.45) = 3.67$ and $p = .004 < .05$. This suggests that memory recall was greater in the delayed dictionary search group than in the control group.

The results suggest that involvement in the search task influenced the accuracy of vocabulary recall in both immediate and delayed tests. However, the low number of participants (10 students in each group) may have contributed to the high levels of variance in the Levene's test. While some observations were made of the influence of the search task on immediate and delayed recall of vocabulary, further testing with a larger sample is recommended.

5. Discussion and Interpretation of Experimental Results

In line with theories that advocate the importance of deeper involvement and strategic teaching, the activation of the "search" involvement factor and the use of the strategy of an online dictionary in our study proved to be an effective enhancing technique enabling search-group learners achieve higher vocabulary retention and suggesting that an enhanced condition has greater vocabulary gains than reading alone. Therefore, our initial research hypothesis that higher levels of involvement will result in increased short-term and long-term retention of novel receptive vocabulary has been attested by the results.

More specifically, the participants of both groups gained a certain number of new words incidentally. The online-dictionary group benefited more and a significant number of new words were learned incidentally while reading for comprehension, as shown particularly by the immediate test results. Compared to the control group who were given the meanings of the new words without having to elaborate on them any further, the online-dictionary group showed a lexical advantage that coincides with the findings of the Involvement Load construct.

In line with Hulstijn and Laufer (2001), it has been assumed that the differential result is down to differential involvement. The twofold dictionary task gave learners the opportunity to experience at least one more encounter with the new words through prolonged exposure which in turn advanced deeper elaboration of the target vocabulary than in the reading task, control group. A combination of both prolonged exposure and elaboration of the target material through activities that learners are engaged in, is considered to promote cognitive processes that strengthen the establishment of, and automatic access to new words in memory (Fraser, 1999; Gass, 1999; Wesche & Paribakht, 2000). In their study, Wesche and Paribakht, engaged their learners in reading only and reading plus tasks and concluded that the latter condition overcame the recognition level as far as word knowledge is

concerned and learners established deeper knowledge of unfamiliar vocabulary. It is assumed that the noticing factors in the twofold task of the search group, i.e., prolonged involvement with the lexical items by having to 1) search for the word meanings, and 2) use the word in a relevant context, functioned to the learners' advantage by promoting awareness of and attention to the new lexical items which is argued to play a leading role in memory enhancement (Schmidt, 1993).

As time affects the depth to which information is processed and is inextricably connected with it, it is assumed that it played a role in the higher vocabulary gain of our online-dictionary group. It happens that learners in the present study were exposed to the target items longer and invested longer time on the more demanding activity, thus experiencing higher retention rates, which seems to be a well-justified outcome. Laufer and Hulstijn consider time as an inherent element of the task and in their experiment the more demanding tasks took longer than tasks with less involvement. However, studies show contradictory results when time is considered as constant for all tasks. Thus, it can be assumed that time allocated should be taken into consideration as a potential variable which can influence the results. Moreover, instructors should pay particular attention to the time factor for class activities.

The depth of processing model (Craik & Lockhart, 1972; Craik & Tulving, 1975) is also highly relevant to this research, as it the most pertinent to the Involvement Load Hypothesis. Laufer and Hulstijn (2001) drew on the model of depth of processing and reached their Involvement Load Hypothesis. According to Craik and Tulving (1975, p. 270), information recall is contingent upon the quality of manipulations and elaboration carried out on the input material in which the participants are involved. In the context of this experiment the twofold task was designed to allow scope for "depth" which is directly dependent upon the noticing levels and cognitive processes involved in the tasks. This was attained by the activation of the "search" element in the dictionary group. When such cognitive processing occurs, there is every likelihood that it will allow for more associations of previous knowledge with the current lexical items and thus the opportunities for these items to be retained are enhanced (Craik & Lockhart, 1972, p. 675).

Further to the depth of processing analysis, a number of studies examined deeper involvement through dictionary use, glosses, inference and multiple-glosses conditions. Fraser (1999, p. 73) showed that consulting a dictionary, when combined with inference, contributes more to the development of cognitive processes which promote vocabulary growth. Rott (2005) supported her argument that form-meaning connections are strengthened through deeper lexical processing by comparing conditions of multiple-choice glosses with single-translation glosses. Her multiple-choice group comprehended and retained a wider range of vocabulary as the strategy fostered by her participants boosted more search and evaluation which also complies with the Involvement Load Hypothesis. In order to find more concrete support for the need for more elaborate lexical processing, Hulstijn (1992) introduced multiple choice glosses in the margin of a reading passage from which readers were induced to make the correct choice. Compared to the single glosses condition, where elaboration and cognitive processing were less demanding, the former group of participants experienced a more beneficial

outcome. Joe (1995) followed the generative model via retelling tasks which also demanded further elaboration and involvement of her participants in the tasks.

Deeper involvement is also interrelated with the *mental effort* invested on a task. It is clear that the mental effort exerted in the “search” task was greater and more cognitive expenditure on the part of the participants seems to have clearly functioned as a memory enhancement facilitator. Since students in the search group had to invest greater cognitive effort than those in the control group in order to find the meanings of the words themselves, differential results were attained, which suggest memory optimization. This result is compatible with Hulstijn (1992) who argues that more demanding mental effort enhances memory performance, as participants are involved in deeper lexical processing and it is also compatible with Sperber and Wilson’s (1995; Wilson & Sperber, 2012) predictions about how increase in mental effort amounts to greater expectations of *relevance* to be yielded. Greater expectations of relevance might be assumed to result in enhanced perception and memory activation as the cognitive system is geared towards a sub-attentive search for *cognitive effects* that could pay off the processing effort expended. In the first objective of his study, participants were expected to infer meanings of unknown words and were compared with participants who were given the meaning of the unknown words. It was found that those who invested more mental effort in carrying out the inference task were able to recall new information better than those with glosses provided. The online-dictionary group can be said to have invested more mental effort firstly through the search for the words’ meaning and secondly via selecting the sentence in which the target word would fit.

As tasks are part of this investigation, Skehan’s (1998) Task-based theory is central to our discussion. It is argued that tasks involve learners in negotiation of meaning and facilitate comprehension (Beglar & Hunt, 2002). Skehan supports that tasks which start from less demanding to more demanding cognitive effort are more balanced and fruitful. The online-dictionary task functioned in this way by involving learners in two consecutive stages of elaboration and the results prove that it promoted learners’ attentional resources. Nonetheless, according to Skehan (1998) the assessment of the task is mainly in terms of output, but in the current experiment the dictionary search task is employed to explore vocabulary retention in the input condition. Judging by the results of a diversity of studies though, tasks trigger learners’ attention to different aspects of the target language and promote vocabulary acquisition, so, whether they come from input or output conditions is considered of no importance. Hulstijn and Laufer (2001) who draw on task-based theory, argue that the task which requires deeper level of processing of the target words, is more effective than a less demanding task. And in this case, participants who were involved in the dictionary search task obtained more vocabulary benefits.

In addition, to some extent, the current results can also be interpreted with reference to VanPatten’s (1996) input processing theory, even though it concerns the domain of grammar. Input Processing is defined as the way learners make form-meaning connections in the input, and the strategies or mechanisms that guide and direct how learners do this in order for input to become intake (VanPatten & Benati, 2010, p. 97). In particular, it holds that input processing brings elements which are crucial for

the language development system to learners' attention and processing techniques are recommended to boost this process and convert input to intake. Such notions are considered relevant to any second language acquisition environment and thus well mentioned. Laufer and Hulstijn's (2001) construct entails input processing but they made it operational in terms of incidental vocabulary acquisition.

In the current twofold dictionary-search task these necessary processes leading to acquisition have taken place. In the first stage learners were given the opportunity to start processing for meaning (e.g., in finding the meaning of the unfamiliar word) and consequently become aware of and attend to the semantic properties of new words. This is in accordance with research which advocates focus on meaning instruction. Skehan (1998) supports that, meaning is fundamental in a communicative task. Krashen (1985) argues the importance of focus on meaning to render input comprehensible. In the next stage, further noticing of the syntactic properties (e.g., in writing a sentence using the unfamiliar word) of the target lexical items is assumed to have aided lexical learning as the task promoted further processing. Focus on form activities, such as looking unfamiliar words up in a dictionary, are considered of pivotal importance (Laufer, 2005; Laufer & Rozovski-Roitblat, 2011). Hulstijn et al. (1996) maintain that attention should be focused not only on meaning but also in relation to the form of the word. Skehan (1998) also maintains that an approach considering attention to both meaning and form is more balanced since it embraces not only structure-oriented approaches but also communication-oriented approaches (Beglar & Hunt, 2002; Martinez et al., 2003). In this experiment, both form and meaning connections seems to have promoted vocabulary enhancement. Barcroft (2004, p. 206), who examined the value of lexical processing in input material, maintains that in order to promote learning of the target word, once learners are presented with the target vocabulary they first need to process these words as input so as to start encoding their forms, activate word meanings and finally make connections between form and meaning. He also supports that activities should progress from less demanding to more demanding tasks so as to allow encoding of the new information. Focusing on this experiment, the online-dictionary group seems to have had the opportunity to first process the target vocabulary (find the meaning of the unfamiliar word) by making limited use of mental resources at an initial stage and been ready to exert more mental effort in the next stage (sentence selection in which the target word is used in the appropriate semantic context). Many other researchers involved their participants in lexical input processing tasks through reading so as to help learners establish form-meaning relationships in their mental lexicon and thus promote learning (Fraser, 1999; Pulido, 2009; Rott, 2005).

Another factor which proved to be crucial in our study is the dictionary strategy. The importance of the online-dictionary has been stressed by a number of other relevant studies based on input enhancement techniques with participants who were engaged in looking up the words when reading for comprehension and offer more support in this investigation (Knight, 1994; Luppescu & Day, 1993; Fraser, 1999). When induced to consult a dictionary, learners automatically decide to attend to the unfamiliar item as they are given a purpose to get involved in a task (Laufer, 2003). This means that

learners make use of cognitive resources in order to process the new information at hand (Lightbown & Spada, 2006). Fraser (1999) in her study investigating three different types of processing strategies, found dictionary use more beneficial (78%) compared to inferencing (52%) and ignoring as lexical processing strategies. Laufer (2000), who investigated electronic dictionaries in correlation with a paper text and marginal glosses, testified to the superiority of the dictionary group over the glosses group and concluded that readers who use a dictionary are more likely to acquire more words than those who do not use one. It therefore seems important to encourage learners use dictionaries. However, although they are urged to make use of a dictionary, learners often avoid doing so, or decide to minimize its use (Cho & Krashen, 1994; Hulstijn, 1993; Hulstijn et al., 1996). As Cho and Krashen mention in their extensive reading programme, the two learners who made active use of a dictionary acquired more vocabulary. Hulstijn et al. (1996) remark that their dictionary group failed to do as well as the glosses group, because participants occasionally deemed looking up the target words irrelevant to their understanding of the text. Knight (1994) compared two different learning strategies, inference of the unfamiliar word and dictionary use with low and high verbal ability students. The low verbal ability students benefited more from the dictionary condition thus showing the superiority of consulting. Luppescu and Day (1993) randomly assigned Japanese participants of EFL to a treatment with a dictionary group and a non-dictionary group. The former outperformed the latter. This result was similar to that of the current investigation but the time taken by the dictionary condition group was almost twice the time of the control group without dictionaries. Despite the negative time-consuming aspect associated with dictionary use and the subsequent slowing down of task completion, it could be argued that these negative aspects are offset by the increase in learner involvement with the target vocabulary. As previously mentioned, time and task are inextricably linked, a factor combination which should be considered carefully in the teaching practice. Returning to our investigation, the vocabulary gain of the dictionary group coincides with the majority of research which promotes dictionaries as comprehension facilitators. The online-dictionary and sentence writing participants succeeded in further elaboration of the novel items through lexical processing stages and thus more aspects of target words were rendered salient, maximizing participants' attentional resources and better establishing form-meaning connections.

The potential role of mental schemata (Anderson & Pearson, 1984) is yet another factor that should be considered in the interpretation of our results, as they could have played a part in promoting better storage of new information in long-term memory. According to schema theory, when knowledge already stored in memory becomes activated it allows new information to integrate with it. In their interaction, old and new information facilitate overall information retrieval processes. It is also argued that when relevant schemata together with textual memory are developed through different types of activities, vocabulary learning is facilitated (Sinclair, 1990). Learners in the online-dictionary group were asked to write a sentence making use of the meaning of the target word in context. The task is very likely to have activated further context-dependent knowledge (Wesche & Paribakht, 2000)

enabling the association of the target words with schemata that may not have been activated in the reading task. The readers' background knowledge in the online-dictionary group seems to have been activated as participants used the selected word *in context*, which very likely brought to mind some kind of correlations to the present information. Once interrelated, new and old information made it easier for the new items to be identified or categorized and thus led to optimal storage in the readers' mental lexicon (Carrell & Eisterhold, 1988). The formation of lexical networks was also promoted, since learners met the target word in two different texts and thus bridged memory traces (Henriksen, 1999).

Last but not least, textual enhancement is a noticing technique which can be deliberately used to allocate learners' attention to certain target features. In our experiment, the fact that the target words on the reading comprehension task were made more salient through the use of a typographical convention of boldface mode (White, 1998) may have contributed to further noticing of the target words which in turn increased the rate of acquisition (Sharwood, 1993) in both Groups 1 and 2. Both groups were presented with the unfamiliar words in bold; it seems however that in the control Group 2 textual enhancement did not prove enough in its own right to lead to better retention.

6. Current Limitations and Suggestions for Future Study

1. The kind of measurement conducted, that is the two t-tests, did not compare each student's progress in the immediate and delayed tests accordingly. Therefore, the relation between each participant's individual performance in the immediate and delayed test accordingly was missed.
2. Whether our participants made a random quick choice when asked to find and write a sentence or indeed expended more mental labor by looking for the more appropriate one available thus optimizing "search" involvement cannot be testified in this research but does affect the final result either, because "search" involvement even in the case of a random quick choice was still higher in Group 1 than in Group 2. A further study may bring forth more evidence about the correlation between the participants varied behavior during search and potential differential results.
3. Additionally, we did not examine the correlation between the type of the target words remembered better by the participants and the frequency of these words' occurrence as this was beyond the scope of our present aims.
4. Finally, instead of using the Google-translate dictionary, a potential study could resort to another one, such as the Dictionary.com, where students have a variety of meanings of words to choose from and can also see the target word used in a quote of individual sentences; this could enable investigation of the acquisition of the pragmatic and context-specific aspects of the target words.

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Notes

Note 1. In general, complex tasks are considered more productive, particularly when they gradually progress from simple to more intricate interactions (e.g., Laufer, 2003, p. 583; Paribakht & Wesche, 1997; Robinson, 2001a).

Note 2. Unlike Hulstijn and Laufer (2001) who examine productive vocabulary retention through tasks of different load and both the levels of input-based and output-based tasks, this paper focuses exclusively on receptive vocabulary development. This means that "output" is outside the scope of our investigation and our interest is only in how learners can maximize their attentional and retention capacity during lexical input processing. Therefore, depth of involvement will be investigated only in relation to its effect on incidental vocabulary learning.

Note 3. Here we adopt the standard view of *incidental vocabulary learning* as a by-product of sub-attentive processes resulting from activities/tasks which are not explicitly geared towards the learning of new lexical items (e.g., Gass, 1999; Huckin & Coady, 1996; Hulstijn, 2001; Joe, 1998; Laufer, 2000, 2003; Schmidt, 1993; Wesche & Paribakht, 1999), in contrast to *intentional learning* of vocabulary defined by VanPatten and Benati (2010) as explicitly geared towards the learning of lexical items in order to remember their meanings.

Note 4. It is self-evident that learners should be guided to choose the kind of dictionary, e.g., monolingual, bilingual or semi-bilingual (Laufer & Hadar, 1997; Laufer & Kimmel, 1997), that best suits their personal learning profile and level of proficiency.