PROMOTING INCIDENTAL VOCABULARY LEARNING: THE USE OF WORD-FOCUSED ACTIVITIES

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Vocabulary is widely acknowledged to be a crucial component of language and communication. However, while it is accepted that first-language (L1) learners learn words incidentally through communication (Nagy & Herman, 1987), the most effective way for second-language (L2) learners to learn words remains a vexed question. Is incidental L2 vocabulary learning, that occurs while learners are engaging in communicative activities, effective as has been frequently suggested (e.g. Krashen, 1989), or is a more explicit focus on words also needed (Laufer, 2005; Zimmerman, 1997)? If so, to what extent do different word-focused activities facilitate vocabulary retention? This study investigates incidental L2 vocabulary learning in a computer-mediated reading setting. The objective of the study is to determine the effect on vocabulary retention of the four different vocabulary learning tasks – reading plus interactive multiple-choice glosses (IMG-only), reading plus vocabulary enhancement exercises (VEE-only), reading plus both IMG and VEE (two-activity), and reading with no supplementary vocabulary activities (reading-only). Forty-five Thai intermediate-level learners of English were put into four different groups (IMG-only, VEE-only, Two-activity, and Reading-only). The vocabulary post-tests reveal that the different reading tasks differently impacted on vocabulary gains when measured immediately and two weeks later. The findings show that word-focused activities had positive impact on lexical knowledge development in both short term and longer term. Students who read and performed word-focused activities remembered more words than those who read only. Moreover, the activity that induced the deeper level of lexical processing (two-activity) helped to mitigate word loss, over the two-week period, better than other activities. The study also found that students liked learning with the IMG better than the VEE as the IMG was an interactive activity which more involved students in the learning process.

Keywords: EFL Vocabulary Learning, Incidental Vocabulary Learning, Word-Focused Activities, Interactive Glosses, Vocabulary Exercises.

INTRODUCTION

Vocabulary is an important component of language and communication. However, while it is accepted that first-language (L1) learners learn words incidentally – that is, unintentionally – through communication, the most effective way for second-language (L2\textsuperscript{1}) learners to learn

\textsuperscript{1} “L2/ FL” and “ESL/ EFL” are interchangeably used throughout the article.
words remains unanswered. Whether incidental L2 vocabulary learning\(^2\) is effective as has been suggested (e.g. Krashen, 1989), or whether a more explicit focus on words is also needed (Laufer, 2005; Zimmerman, 1997) need further investigation. This study attempts to address some of the issues underlying these questions by focusing on incidental L2 vocabulary learning in computer-mediated reading. It examines the impact of text-based word-focused activities – an interactive multiple-choice gloss activity and a vocabulary enhancement exercise activity – on word retention.

**RESEARCH BACKGROUND**

“Incidental vocabulary learning” refers to the unintended learning of words that occurs in the course of engagement with other communicative activities, and is regarded by some scholars as the most effective form of word learning. Krashen (1982) contends that successful (second) language acquisition depends on communication in the target language so that learners are focused on the messages, rather than the forms. Despite such claims, the question persists of whether this is an effective way of learning vocabulary.

**Incidental L2 vocabulary learning through reading**

Vocabulary learning through *reading* is one of major approaches of incidental vocabulary learning. Vocabulary knowledge and reading are closely related – vocabulary development is both a cause and a consequence of reading abilities (Stoller & Grabe, 1993). Reading is typically considered to be an excellent source of vocabulary development. As Paribakht and Wesche (1997) have pointed out, reading has a key advantage over aural language: “Although aural language experience is important, written language normally contains a higher proportion of difficult or low-frequency (unfamiliar) words; thus, reading is normally the major vehicle for continued vocabulary acquisition” (p. 175). In an EFL context, reading is crucial, since it is both an effective way for EFL learners to develop vocabulary in the classroom setting (Zhang & Xu, 2009), and a practical way to learn a language out of the classroom (Nation, 2001). A large number of studies have shown that lexical items can be learned incidentally as a by-product of reading in L2 contexts (e.g. Horst, 2005; Horst, Cobb, & Meara, 1998; Pellicer-Sánchez & Schmitt, 2010; Pigada & Schmitt, 2006). However, incidental learning is not necessarily effective (Augustin-Llach, 2009; Laufer, 2005; Raptis, 1997; Zimmerman, 1997). It has been shown that vocabulary gains from reading, particularly for L2 learners, have been found to be slow and inefficient. For example, Pitt, White, and Krashen (1989) reported that only 2 out of 29 words (6.89%) were acquired. Zahar, Cobb, and Spada (2001) reported a similar finding with 2.16 out of a possible 30 words (7.2%) acquired. Hulstijn (1992) has indicated that “the retention of word meaning in a true incidental learning task is very low indeed” (p. 122). The small amount of lexical growth, that has been reported, calls into question the efficacy of incidental learning.

There are several possible explanations for the small gains in incidental L2 vocabulary learning when reading for comprehension. A low level of personal engagement by learners with new vocabulary is possibly one of the strongest explanations (Schmitt, 2008).

\(^2\) “Learning” and “acquisition” are used interchangeably.
Engagement in L2 vocabulary learning

It is usually taken for granted that learners successfully acquire words through exposure to language input. Unfortunately, this is not always true for L2 learners (Laufer, 2005). Vocabulary learning from reading can be ineffective, due to the inadequacy of vocabulary engagement (Schmitt, 2008). When reading, L2 learners often fail to notice unfamiliar words, or to process lexical information elaborately. Four main components are associated with vocabulary engagement: noticing, elaboration, meaning verification, and frequency of exposures. These will be explained in the next subsections, with particular reference to incidental vocabulary learning through reading.

2.2.1 Noticing

Noticing, or awareness, is considered a key factor for learning to take place, as it generally precedes (language) learning and determines internalization of language (Hulstijn, 1989, as cited in Rosa & O’Neill, 1999; Schmidt, 1990, 1995, 2001; Van Patten, 1990, 1994). It is generally agreed that selective attention plays a major role in learning (Gass & Selinker, 2008, p. 355). As Robinson (1995) has suggested, learning without awareness may be possible, but is so limited that its effects are negligible.

In terms of vocabulary acquisition, Paradis (2000, as cited in Laufer, 2005b) contends that “those who argue that some learning can be implicit, i.e. occur without attention to what is being learnt, state that this is so in the case of grammar, not vocabulary” (p. 313).

A potentially important aspect of noticing helps to explain why incidental learning through reading tends to produce low vocabulary improvement. It is generally accepted that L2 readers are aware of unfamiliar words when they come across them in a reading text. However, this is not always the case. Evidence has shown that when reading for comprehension, learners often fail to notice unknown words. The reasons for this are varied: the words are not salient (Brown, 1993), the words are not important for text comprehension (Fraser, 1999; Hulstijn, 1993; Peters, Hulstijn, Sercu, & Lutjeharms, 2009), unfamiliar words are misunderstood as familiar ones (Laufer, 1988, 1997; Laufer & Yano, 2001). Watanabe (1997) has pointed out that, even if the input is comprehensible, successful learning cannot be expected if learners do not notice words (p. 303). Failure to notice words inhibits further processing, thus leading to ineffective learning.

Elaboration of lexical processing

Noticed words need to be processed elaborately if their meanings are to be discovered. Elaboration of lexical information is one of keys for effective word learning (Peters et al., 2009). The elaboration of encoding is important for recall (Matlin, 1994, as cited in W. T. Wang, 2005). As noted by Hulstijn (2001), the quality of the information processing (e.g. elaboration of aspects of form-meaning connections) is linked to vocabulary retention. The importance of elaborate processing is supported by the Level of Processing Theory (Craik & Lockhart, 1972; Craik & Tulving, 1975).

According to the Level of Processing Theory, the degree (shallowness or depth) with which a piece of new information is processed determines how well the information is retained. The deeper words are processed, the better they are retained. With reference to vocabulary learning,

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3 This study does not differentiate the terms “noticing” and “awareness”. They both refer to learners’ realisation of unfamiliar words when reading a text.
words whose meanings are inferred are expected to be recalled better and longer than those whose meanings are given. This is because, when learners infer word meanings, they put greater effort to process lexical information at a deeper level. When, on the other hand, a correct meaning of a word is already given, there is no need to infer meanings. Since no intensive processing is required, effective learning is unlikely to take place (Hulstijn, 1992).

When reading for comprehension, noticing words does not necessarily guarantee elaborative lexical processing. Learners may choose to ignore words, or not to work any further with them, especially if they think they can understand the text without the words. Wesche and Paribakht (2000) found that while some of the participants in their experiment tried to infer word meanings, others reported that they noticed the words, but showed no sign of further processing. A reading comprehension activity does not necessarily engage learners in in-depth lexical learning.

**Meaning verification**

Discovery of the correct meaning(s) of a word is a further key to successful vocabulary learning (Peters et al., 2009). The advantage of verifying meaning is twofold: it prevents wrong meaning inferences, and it helps foster (correct) meaning into learners’ memory (Grace, 1998).

Although in-depth word processing, via inferring meaning from context, is conducive to better retention, learners only benefit from it when the correct meaning is reached. Empirical evidence (Bensoussan & Lafer, 1984; Kaivanpanah & Alavi, 2008; Mondria & Wit-de Boer, 1991) suggests that meaning inferencing is neither as effective nor as simple as previously thought. Inferring meaning from context is complicated, and involves a wide range of factors (Fukkink, 2002). For instance, the quality of contextual clues (Zahar et al., 2001), learners’ language ability (Kaivanpanah & Alavi, 2008). Learners often infer meanings incorrectly (Hulstijn, 1992; Kelly, 1990; Martínez-Fernández, 2008; Watanabe, 1997), due to difficulties in inferring word meaning from context (Haynes, 1993). If an incorrect meaning is attained and retained, no effective learning can be claimed.

When reading for comprehension, learners are not provided the opportunity to verify their inferences as to meaning. It is true that they can look up words in a dictionary, or consult other sources (e.g. teachers). If they do, meaning verification is achieved. Unfortunately, L2 learners seldom check for meaning in a dictionary (Hulstijn, 1993; Hulstijn, Hollander, & Greidanus, 1996; Lenders, 2008). Even if they check for meaning, unverified inferencing is still possible, since a dictionary usually provides multiple entries defining the meanings of a word, leaving learners uncertain which one to choose (Bensoussan, 1983; Koren, 1997; Li, 2010). A lack of meaning verification impedes effective and efficient vocabulary learning and retention.

It may be argued that it is also possible that learners could infer meaning correctly. Even if that is the case, however, learners still need to be assured of the correctness of their inferences, since the assurance of the form-meaning link can help to reinforce retention (Grace, 1998). The benefit of meaning verification in promoting word learning and retention has been reported in several studies (Koren, 1999; Murphy, 2007; Nagata, 1999).

**Text-based word-focused activities in L2 vocabulary learning**

The importance of integrating word-focused activities into reading to promote L2 incidental vocabulary learning has been acknowledged by researchers (e.g. Laufer, 2005; Zimmerman,
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Stoller and Grabe (1993) suggested that reading plus related vocabulary activities might be an appropriate way to direct and enhance incidental vocabulary learning and retention.

The advantages of text-based word-focused activities in enhancing vocabulary acquisition and retention are attributed to a higher level of vocabulary engagement. The word-focused activities involve learners more in the lexical learning process – learners attend to words and process the words elaborately. A number of previous studies have shown positive effects for the reading plus vocabulary activities approach on L2 word learning, compared to the reading-only approach. In other words, learners learn and retain words more effectively when required to perform word activities in addition to reading (Sonbul and Schmitt, 2009).

Supplementary word activities can be performed in many ways, such as direct instruction of word meaning, writing tasks, or using a dictionary, to name but a few. Most common, however, is the use of post-reading vocabulary exercises (Min, 2008; Paribakht & Wesche, 1997), and glosses (e.g. Bowles, 2004; Rott, Williams, & Cameron, 2002; Yanguas, 2009) – which are the primary concern of the current study.

Vocabulary enhancement exercises

A text-based vocabulary enhancement exercise refers to an activity that is integrated into a main reading task to facilitate L2 vocabulary acquisition. It is common practice to use vocabulary exercises to enhance L2 vocabulary learning (Stoller & Grabe, 1993). These exercises are helpful for several reasons. They provide more opportunity of word exposures. Learners are enabled more encounters, more retrievals, and more practices, all of which potentially promote better word acquisition and retention. A variety of exercises can also help to enrich and broaden various aspects of lexical knowledge. To give two examples: matching-words-with-definitions exercises enhance recognition and association between word form and its meanings, while open-cloze exercises develop productive knowledge (Weschke & Paribakht, 2000). Supplementary vocabulary exercises have empirically proven more effective than reading for comprehension, as reported in a large number of experimental investigations (Paribakht and Wesche, 1996, 1997, 1999).

Glosses

Glosses in both L1 and L2 can be defined as an explanation of the meaning of a word (Pak, 1986, as cited in Lomicka, 1998), a brief definition, or a synonym (Nation, 2001). Glossing has been reported as a facilitator for vocabulary learning. Glosses help to direct learners’ attention (noticing) to targeted forms (Bowles, 2004; Yanguas, 2009), and offer the easiest way to attain the meanings of words in a reading text (Koren, 1999), thus preventing erroneous inferences (Nation, 2001). Glosses also increase the opportunities for new words to be learned, and activate elaborate processing, provided that learners try to connect forms and meanings, and associate the form-meaning link with previous knowledge via rehearsal (Pulido, 2009, p. 33). A majority of empirical studies acknowledge the effectiveness for vocabulary learning of printed glosses (Cheng & Good, 2009; Holley & King, 1971; Hulstijn et al., 1996; Jacobs et al., 1994; Lin & Huang, 2008; Wang, 2005; Watanabe, 1997) or computerised glosses (Al-Seghayer, 2001; Bowles, 2004; Chun & Plass, 1996; Huang & Liou, 2007; Koren, 1999; Nagata, 1999; Shahrokni, 2009; Yanguas, 2009; Yoshii, 2006).

Conventionally, a gloss refers to a single gloss (SG) in which a brief definition or translation for an unknown word is provided somewhere near the text (Rott et al., 2002). Although (single)
glosses are beneficial for vocabulary learning, the positive effect tends to diminish in long-term retention (Bowles, 2004; Chang, 2002, as cited in Lin & Huang, 2008; Wang, 2005). The lesser effectiveness of long-term retention is possibly explained by a lack of in-depth processing. Since meanings of words are already provided, learners have no need to infer them. This weakness (a lack of elaborate lexical processing) of single glosses has led to the use of multiple-choice glosses (Hulstijn, 1992).

<table>
<thead>
<tr>
<th>Single Gloss (SG)</th>
<th>Multiple-choice Gloss (MG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blissful</td>
<td>1) Sad</td>
</tr>
<tr>
<td></td>
<td>2) Happy</td>
</tr>
<tr>
<td></td>
<td>3) Painful</td>
</tr>
<tr>
<td></td>
<td>4) Extreme</td>
</tr>
</tbody>
</table>

Figure 2.1. Single gloss vs. Multiple-choice gloss.

A multiple-choice gloss (MG) refers to a gloss in a multiple-choice format “with one or more alternatives serving as distracters in addition to one correct meaning” (Wang, 2005, p. 15). As illustrated in Figure 2.1, in MG, a set of definitions (“sad”, “happy”, “painful”, and “extreme”) is provided, from which learners choose one alternative. Hulstijn (1992) makes the claim that MG encourages a higher degree of processing, while at the same time reducing the possibilities of wrong inferencing – a common problem when inferring meanings from contexts, as previously discussed. When reading a text with MG, learners’ attention is drawn to an unknown word. However, instead of being given the (correct) meaning of that word, learners must infer the meaning that best suits a particular context with the help of alternatives provided in multiple-choice glosses. Since learners work harder with the words when reading with MG, vocabulary acquisition and retention are potentially facilitated. Studies comparing the effects of SG and MG on word learning reported mixed results, although in favour of MG (Hulstijn, 1992; Lin & Huang, 2008; Miyasako, 2002, as cited in Al-Jabri, 2009; Rott & Williams, 2003; Rott et al., 2002; Wang, 2005; Watanabe, 1997).

The inconsistent benefit of MG over SG may be attributed to wrong inferencing. Since MG does not inform learners which meaning from a set of options is correct, they may fail to infer the correct answer and memorise the wrong meaning. Although MG helps to decrease the chances of wrong-meaning inferring by providing a set of possible meanings to choose from, the risk for wrong inferring remains. As Hulstijn (1992) cautioned, a high probability of incorrect inferring was still found when reading with MG. Martínez-Fernández (2008) also found that although participants processed the words at a deeper level when reading with MG than with SG, they did not always choose the right option (correct answer). The interactive multiple-choice gloss was developed to rectify this problem by allowing learners to verify their meaning inferencing with the aid of an immediate feedback (Nagata, 1999).

An interactive multiple-choice gloss (IMG) is a computerised MG with immediate feedback. Since learners are able to verify their inferences with the feedback, the problem caused by incorrect inferences is resolved. An IMG encourages a higher level of vocabulary engagement than SG or MG, since it not only triggers word noticing and induces deeper processing, but also enables immediate meaning verification.

Despite the potential benefits of IMG for incidental L2 vocabulary acquisition, empirical research on this glossing type is surprisingly limited. To date, only two studies relevant to IMG
have been conducted: one to investigate the effect of IMG directly (Nagata, 1999), the other to investigate the effect of IMG indirectly (Koren, 1999).

In summary, the review of the literature supports the view that incidental vocabulary learning from reading, mainly by inferring word meanings from context, takes place for both L1 and L2 learning. However, gains are usually small, especially in an L2 learning context where inadequate (target) language ability often obstructs successful meaning inferencing, and exposure to L2 input is limited. Reading for comprehension alone is unlikely to promote a high engagement in vocabulary learning – a key factor for effective lexical development. Supplementing reading with activities helps to engage learners in vocabulary more actively (Schmitt, 2008).

Research on glossing has empirically shown the benefits of glosses on L2 vocabulary learning. The interactive multiple-choice glosses, accompanied with an immediate feedback potentially facilitate lexical development better than traditional single or multiple-choice glosses. However, evidence for the effectiveness of interactive multiple-choice glosses is very limited, particularly with regard to long-term word retention. Studies investigating the impact of post-reading vocabulary exercises (here, gap-filling) are also limited, especially in the incidental learning context. Furthermore, few of the empirical studies published to date have thoroughly examined the comparative effects of interactive multiple-choice glosses and gap-filling exercises on incidental L2 vocabulary retention. This study would help us to understand better how different activities are associated with vocabulary learning and retention.

**METHODOLOGY**

**Research design**

The current study was a (4 x 2) mixed-method design. The between-subjects variable – “**Reading Condition**” (four reading conditions) – was used to study the potential effects of the different reading treatments. The within-subjects variable – “**Time**” (immediate and delayed timings of vocabulary post-tests) – was implemented to investigate the differences between short-term and longer-term vocabulary retention, given that short-term retention refers to the memory of the form and word meaning immediately after the reading event, whereas longer-term retention denotes the memory of the form and word meaning two weeks after the reading event.

The four reading conditions differ in terms of the presence, absence, or combination of the two types of word-focused activity – the interactive multiple-choice gloss (IMG), and the vocabulary enhancement exercise (VEE). Specifically, in Group 1 (two-activity), the participants consulted the interactive multiple-choice gloss while doing the on-screen reading, then did the vocabulary gap-filling exercise after reading. Group 2 (IMG-only) also consulted the interactive gloss while doing the on-screen reading. They, however, were not given any vocabulary exercise. The participants in Group 3 (VEE-only) performed the on-screen reading but without the gloss. After reading, they were asked to do the vocabulary exercise. The participants assigned to Group 4 (reading-only) read the on-screen texts without the gloss, and did not do the vocabulary exercise.

**Research question**

The research question of the study is:
Do the four reading conditions have differential effects on vocabulary retention, in terms of word meaning knowledge, on the immediate test and the delayed test?

It is concerned with the effects of the four different reading conditions – reading plus two word-focused activities (the interactive gloss and the vocabulary exercise), reading plus the interactive gloss, reading plus the vocabulary exercise, and reading only – on word retention.

Participants

The original pool of participants was 55 Thai intermediate-level learners of English. However, 10 participants were omitted because they failed to complete all the tasks. The remaining 45 students participated in this study. The participants consisted of 18 male and 42 female second-year students from three classes at a public university in Bangkok, Thailand. Their ages ranged from 18-22 years. Most of them had been studying English for more than 12 years. They were computer-literate and familiar with on-screen reading. The students took part in the experiment on a voluntary basis with a small sum of money to compensate for their time.

Reading materials

The study used two computer-based reading texts. Two non-fiction articles published in New Scientist – “Rules of Attraction” (Douglas, 2004) and “How to Pick a Perfect Mate” (Haselton, 2006) – were selected. They were modified to make them more appropriate to the proficiency level of the participants (EFL intermediate learners), and to fit into a 25-minute reading session. Since the study involved the application of an electronic gloss, reading needed to be mediated by computer. Each of the two reading texts was converted into the forms of computer-based texts (see Appendix A). No special knowledge or technical skills were required from students when they performed the on-line reading. The computer-based reading texts were uploaded to a webhost and could be accessed during the experiment via Internet at http://srichamn.ac.webfusion.co.uk/view.htm.

Target words

The target words employed in the current experiment consisted of 16 academic words taken from Coxhead (2000) Academic Word List (AWL)\(^4\). They were eight adjectives (apparent, attainable, crucial, inaccessible, inclined, potential, rational, sole) and eight verbs (anticipate, assess, conform, encounter, fluctuate, perceive, pose, undertake).

Interactive multiple-choice gloss (IMG)

Following a study by Nagata (1999), this research utilised an interactive multiple-choice gloss (IMG) accompanied with a set of three possible L1 meaning translations for a target word (correct meaning, related meaning, and opposite meaning) for students to choose from. The IMG provided immediate feedback which would allow learners to verify whether or not their selected

\(^4\) Further information and the complete list of AWL is available at http://www.victoria.ac.nz/lals/resources/academicwordlist/
choice of word meaning was accurate. The IMG reading programme was developed using Microsof.NET framework. (See Appendix A-II for the screenshot of the reading programme with the IMG.)

While reading, students can simply click on a highlighted target word and see in the right-hand margin of the screen a set of three possible alternative meanings of that particular word. The students choose the meaning that best fits that particular context. They can also check whether the selected meaning is correct or not by clicking on the immediate feedback (“Check Answer”) option. If it is correct, the programme replies “Correct. Well Done!” They can then continue reading. If the chosen answer is wrong, the programme responds “Incorrect. Try Again!” The students are then encouraged to reread the text and select the meaning again until they get it correct.

Vocabulary enhancement exercises (VEE)

The vocabulary exercise employed in this study was a gap-filling type. One reason for choosing this type of exercise is that a gap-filling is fairly efficient (Folse, 2006). It is also not too difficult, and can be done in a short time. There were two gap-filling exercises corresponding to the two reading texts. Each exercise focused on the eight new target words which occurred in each of the two texts. In each exercise, 16 words (eight target words and eight distracters) with their L1 meaning translations and eight gapped sentences were given. The contextual information provided in each gapped item was one-sentence long.

Students were presented gapped sentences and lists of words (target words and distracters) with their meaning translations. They had to fill in each gapped item with the most appropriate word chosen from the list. They were told that each word could only be used once. When the exercise was completed, they were given the feedback sheet in the form of an answer-key checklist to check against their own answers (see Appendix B for the VEE activity).

Reflection paper

A short reflection paper refers to a personal response to the texts that have been read. The students were asked to produce a short piece of writing in English giving their reactions to the two reading texts – what do they think about the story they have just read. They could write as much as they wanted (at least seven sentences) in the ten minutes they were allowed. The purpose of including this activity as a post-reading activity was solely to keep a balanced amount of time between the groups who did the VEE after reading (Groups 1 and 3), and the groups who otherwise would have had no follow-up VEE (Groups 2 and 4). Since this task was not a major concern of the study, it was not analysed further.

Vocabulary measurement instruments

The batteries of vocabulary tests (i.e. pre-test and post-test) were administered to the participants. The pre-test – Target Word Test (TWT) – aimed to assess existing knowledge of the target words. It was done prior to the experiment. Thirty-five items were included (16 target words and 19 distracters). A high number of distracters was used to avoid making the students aware of the target words. The test required the students to provide meanings for the given English words (meaning-supply test). They could write in either Thai or English. If they were not sure, they were allowed to guess.
The post-test, on the other hand, was given at the end of the second reading session and again two weeks later. This study employed the post-test battery assessing the fundamental aspect of lexical knowledge (form-meaning connections).

**Interview**

A semi-structured retrospective interview was conducted to elicit further information concerning the reading tasks. The interview aimed to prompt students to reflect on their experience of the main reading activities and other relevant features of the activities. For instance, students were asked what they thought about the reading activities, the IMG, the immediate feedback, the VEE. Eight participants (two from each of four groups) were selected on a convenience basis. The interviews were conducted in Thai (participants’ native language) after the completion of the final experimental session.

**Data collection procedures**

The data collection procedures are summarised in Table 3.1.

**Data analysis**

The students’ performances on the vocabulary post-tests, and the interview were analysed quantitatively and qualitatively, using quantitative or qualitative procedures as appropriate. Specifically, the students’ answers on the immediate and the delayed vocabulary post-tests were objectively scored and analysed using the Statistical Package for the Social Sciences (SPSS).
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For the interview, all eight interviews were transcribed and translated into English, then analysed to see what the students thought about the reading tasks, word activities and other aspects of the study (e.g. the use of the interactive gloss, the vocabulary exercise, the provision of immediate feedback). The interview data are not fully reported in this study as these were not the major focus of the study. However, they are used to supplement the discussion – for example, the students’ opinions on the IMG and the VEE activities might help to shed light on the score differences across conditions.

RESULTS

This section reports the principal results in relation to the research question.

RQ: Do the four reading conditions have differential effects on vocabulary retention, in terms of word meaning knowledge, on the immediate test and the delayed test?

The focus of the research question is whether the different conditions of the four reading groups have a different impact on the performance on the post-test scores, and whether the differences (if any) hold true on both immediate and delayed tests.

We first consider the scores on the immediate test. The mean scores in Table 4.1 demonstrate that Group 1 performed the best ($M = 60.44, SD = 18.16$). Group 2 had the second highest score ($M = 49.05, SD = 14.41$). Group 3 had the third highest score ($M = 43.51, SD = 15.42$). Group 4 had the lowest scores ($M = 18.35, SD = 7.62$).

Table 4.1. Mean scores by Group: Immediate test.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>12</td>
<td>60.44</td>
<td>18.157</td>
</tr>
<tr>
<td>Group 2</td>
<td>11</td>
<td>49.05</td>
<td>14.410</td>
</tr>
<tr>
<td>Group 3</td>
<td>11</td>
<td>43.51</td>
<td>15.415</td>
</tr>
<tr>
<td>Group 4</td>
<td>11</td>
<td>18.35</td>
<td>7.622</td>
</tr>
</tbody>
</table>

Note. Group 1 = Two-activity, Group 2 = IMG-only, Group 3 = VEE-only, Group 4 = Reading-only

Turning to the ANOVA, this again indicates a highly significant effect for Group ($F(3, 41) = 16.94, p < .001, \eta^2 = .554$).

Table 4.2. Tests of between-subjects effects (Group): Immediate test.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>p-value</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>10737.589</td>
<td>3</td>
<td>3579.196</td>
<td>16.944</td>
<td>&lt;.001</td>
<td>.554</td>
</tr>
<tr>
<td>Error</td>
<td>8660.778</td>
<td>41</td>
<td>221.238</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

df = degrees of freedom; $\eta^2$ = partial eta squared (effect size)

Note that the mean scores are all reported in percentages, the alpha level (significance level) is set at .05 ($p < .05$) for all analyses, and the effect size values ($\eta^2$) are considered small ($\eta^2 > .0099$), moderate ($\eta^2 > .0588$), and large ($\eta^2 > .1379$).
Post-hoc comparisons (Table 4.3) show that the three groups who read with word-focused activities (Group 1: two-activity, Group 2: IMG-only, and Group 3: VEE-only) significantly outperformed the group who only read the texts (Group 4): $p < .001$ comparing Group 4 with Groups 1 and 2; $p = .001$ for Group 4 against Group 3. Although Group 1 learned more words than Groups 2 or 3, no statistical significance is reported among the three groups who did either one or two word activities.

Table 4.3. Post-hoc tests by Group: Immediate test.

<table>
<thead>
<tr>
<th>(A) Group</th>
<th>(B) Group</th>
<th>Mean Difference (A-B)</th>
<th>SE</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Group 2</td>
<td>11.39</td>
<td>6.808</td>
<td>.362</td>
</tr>
<tr>
<td></td>
<td>Group 3</td>
<td>16.93</td>
<td>7.005</td>
<td>.105</td>
</tr>
<tr>
<td></td>
<td>Group 4</td>
<td>42.09*</td>
<td>5.723</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Group 2</td>
<td>Group 3</td>
<td>5.54</td>
<td>6.362</td>
<td>.820</td>
</tr>
<tr>
<td></td>
<td>Group 4</td>
<td>30.70*</td>
<td>4.915</td>
<td>.000</td>
</tr>
<tr>
<td>Group 3</td>
<td>Group 4</td>
<td>25.16*</td>
<td>5.185</td>
<td>.001</td>
</tr>
</tbody>
</table>

*The mean difference is statistically significant.

To summarise, in the immediate test, word-focused activities (Groups 1, 2, and 3) enhanced vocabulary learning substantially better than reading with no activity (Group 4). However, no differences were reported between the three groups who performed word activities.

We now turn to the analysis of the delayed test scores. A similar pattern was found here. The descriptive statistics in Table 4.4 show that Group 1 scored higher ($M = 41.73$) than Group 2 ($M = 28.20$), Group 3 ($M = 19.35$), and Group 4 ($M = 7.63$).

Table 4.4. Mean scores by Group: Delayed test.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>12</td>
<td>41.73</td>
<td>18.282</td>
</tr>
<tr>
<td>Group 2</td>
<td>11</td>
<td>28.20</td>
<td>12.214</td>
</tr>
<tr>
<td>Group 3</td>
<td>11</td>
<td>19.35</td>
<td>12.630</td>
</tr>
<tr>
<td>Group 4</td>
<td>11</td>
<td>7.63</td>
<td>4.397</td>
</tr>
</tbody>
</table>

The ANOVA (Table 4.5) reveals a significant effect with a large effect size – $F(3, 41) = 14.01$, $p < .001$; $\eta^2 = .506$. This again indicates some significant difference among the mean scores of the groups.
Promoting Incidental Vocabulary Learning: The Use of Word-Focused Activities

Table 4.5. Tests of between-subjects effects (Group): Delayed test.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F-value</th>
<th>p-value ( (\eta^2) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>7131.961</td>
<td>3</td>
<td>2377.320</td>
<td>14.010</td>
<td>000</td>
</tr>
<tr>
<td>Error</td>
<td>6957.046</td>
<td>41</td>
<td>169.684</td>
<td></td>
<td>.506</td>
</tr>
</tbody>
</table>

df = degrees of freedom; \( \eta^2 \) = partial eta squared (effect size)

To find out where the significant differences lay, post-hoc tests were carried out. Statistically significant differences were found in only three of the six possible group comparisons. As shown in Table 4.6, Groups 1 and 2 (both had IMG while reading) showed considerably higher gains than Group 4 (reading-only) – \( p < .001 \) for Group 1 against Group 4, and \( p = .001 \) for Group 2 against Group 4. However, interestingly, no statistical significance was found between the scores of Group 3 (VEE-only) and Group 4 – \( p = .054 \). It should be noted that since the \( p \)-value is approaching the significance level (.05); it is not impossible that, in a larger sample size, the non-significant difference could become significant.

A further striking finding in the delayed test is that Group 1 (two-activity) obtained significantly higher scores than Group 3 (VEE-only) – \( p = .013 \). No other significant mean differences for the groups that had word activities were found. This may suggest that the effectiveness of the VEE was not durable over a longer period of time. This will be discussed in more detail in the Discussion section.

Table 4.6. Post-hoc tests by Group: Delayed test.

<table>
<thead>
<tr>
<th>(A) Group</th>
<th>(B) Group</th>
<th>Mean Difference (A-B)</th>
<th>SE</th>
<th>( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Group 2</td>
<td>13.53</td>
<td>6.435</td>
<td>.188</td>
</tr>
<tr>
<td></td>
<td>Group 3</td>
<td>22.37*</td>
<td>6.508</td>
<td>.013</td>
</tr>
<tr>
<td></td>
<td>Group 4</td>
<td>34.09*</td>
<td>5.441</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Group 2</td>
<td>Group 3</td>
<td>8.85</td>
<td>5.297</td>
<td>.365</td>
</tr>
<tr>
<td></td>
<td>Group 4</td>
<td>20.57*</td>
<td>3.914</td>
<td>.001</td>
</tr>
<tr>
<td>Group 3</td>
<td>Group 4</td>
<td>11.72</td>
<td>4.032</td>
<td>.054</td>
</tr>
</tbody>
</table>

*The mean difference is statistically significant.

Note. Group 1 = Two-activity, Group 2 = IMG-only, Group 3 = VEE-only, Group 4 = Reading-only

To summarise, on the delayed test, the groups that did the gloss while reading (Groups 1 and 2) significantly outperformed the reading-only group (Group 4), but the VEE-only group (Group 3) did not. In addition, the VEE-only group performed significantly worse than the two-activity group.

According to the results previously presented, it can be concluded that on the immediate test, the reading-only group did significantly less well than the other three reading-plus-activity groups. The scores of two-activity, IMG-only, and VEE-only groups did not differ substantially from each other. On the delayed test, the conditions had a clearer impact – in favour of those who did the IMG over the reading-only group, and against those who did the VEE-only compared with the two-activity group.
DISCUSSION

The findings summarised in the previous section suggest three major claims which merit further discussion: (1) a greater advantage for the reading-plus-activity conditions over the reading-only condition, (2) an advantage for the combination of two activities over just one activity, and (3) a more durable effectiveness of the IMG-activity compared to the VEE-activity.

Reading plus word-focused activities vs. Reading-only

The reading-plus-activity conditions were more beneficial to vocabulary retention than the reading-only condition. This suggests that simply reading, although it improved the learners’ lexical knowledge to a small degree, is not as efficient, as reading and performing some word-focused activities. This finding is consistent with previous empirical studies indicating that learners who read with word activities show higher gains than learners who read with no word activities. Specifically, the application of glosses, especially electronic glosses, is beneficial for word learning (Huang & Liou, 2007; Li, 2010; Rott et al., 2002; Yanguas, 2009). The provision of vocabulary exercises also enhances vocabulary acquisition (Browne, 2003; Laufer, 2001; Min, 2008; Wesche & Paribakht, 2000). Plausible explanations exist for the benefits of the reading-plus-activity condition on vocabulary learning and retention.

The most important factor is related to level of processing and the involvement load. According to the Level of Processing Theory (Craik & Lockhart, 1972; Craik & Tulving, 1975), the deeper the information is processed, the greater chance it is better remembered. In this study, the learners who did word-focused activities were required to put in greater effort, as well as to process the lexical information at a deeper level, than those who simply read the passages. As a result, the reading-plus-activity groups acquired more words than the reading-only group. Students who read with the IMG needed to infer the meanings of particular words from the contexts, evaluate the possible meanings, and choose the correct meanings from the set of options provided in the multiple-choice gloss. They thus processed the information (i.e. the words) more elaborately, leading to higher vocabulary gains. Likewise, the groups that did the gap-filling exercises in addition to reading, were potentially more engaged with words, because they had to process the lexical information in depth (e.g. evaluate the words) in order to fill each gapped sentence with the most appropriate word from the list. This again could result in better word retention.

The interview data transcribed below illustrates that the students in the reading-plus-activity groups seemed to process the lexical information (forms and meanings) more deeply.

| Student B10 (IMG-only group) |
The programme was really interesting... It was challenging. You had to try [inferring meaning] first, and then checked the answers after. |
|-----------------------------|

| Student D13 (VEE-only group) |
I think it [the vocabulary exercise] was helpful for learning words because you can concentrate on words more. Sometimes when I read, I don’t pay enough attention to the words, but I did when I was doing the exercise, because it made me. |
|-----------------------------|

Note. [...] = comment added by the researcher
In the interview extracts, terms such as *challenging*, and *concentrate on words* imply that doing extra word activities triggered in-depth processing of words rather than simply coming across them.

In contrast, the reading-only group simply read the texts. They were not required to do any additional activities. It was highly likely that the students who only read the texts without doing any word-focused activities might not even notice the unknown target words, especially if they were able to understand the texts without knowing those words. A possible lack of word noticing for the reading-only group would have obstructed further input processing, resulting in poor word retention.

A further plausible explanation for why the reading-plus-activity groups outperformed the reading-only group could be “meaning verification”. Grace (1998) has suggested that vocabulary acquisition and especially retention can be enhanced by the verification of meaning. This is because, when the learners can verify the meaning they have inferred, they are able both to correct their wrong inferences and to reaffirm the correct meaning of the word. The word-focused activities enabled the students to check and verify the meanings of the words through the immediate feedback (for the IMG-activity) or with the answer checklist (for the VEE-activity). By verifying the word meanings, they could know the accurate meanings of the words. Meaning verification could also help reinforce word retention as shown in the interview extract of one student.

### ST A09 (Two-activity group)

With the immediate feedback, I could check the meaning of the word right away by clicking on the ‘check answer’ icon. So, I could get the correct meanings of the words easily. I didn’t need to consult a dictionary, which I rarely do, because I’m too lazy.

*Note.* [... ] = comment added by the researcher

As the examples show, the students who used the interactive multiple-choice gloss viewed the prompt interactive feedback positively as *convenient* (easy to get the correct meanings), which would assist them in learning words more effectively.

Unlike the reading-plus-activity conditions, the reading-only condition gave no opportunity to verify the word meanings. The students who read the texts without activities might have tried to infer the meanings of the words from the contexts, but they had no way of verifying whether the meaning they had inferred was correct. This claim is supported by the interview data implying that the students in the reading-only group tended to find meaning inferencing from context alone difficult.

### ST C02 (Reading-only group)

I wish I could have had the gloss [when reading]. It looks interesting and should be more helpful than what I did (only reading). That’s because, there were difficult words I didn’t know. So I found it hard to understand some parts [of the texts].

*Note.* [... ] = comment added by the researcher
To summarise, the benefits of the reading-plus-activity condition over the reading-only condition can be explained by two major factors – level of processing (which can be associated with absence of noticing), and meaning verification. Performing word-focused activities in addition to reading enabled deeper levels of word processing and the opportunity to verify meaning inferences, thereby contributing to better retention.

**Reading plus two activities vs. Reading plus one activity**

There was a potential if unclear advantage for the two-activity group over the one-activity groups in short-term retention. However, the combination of two activities showed an evident and strong positive impact on longer-term retention.

The non-significant effectiveness of the combination of two activities on the immediate-test scores implies that, in general, regardless of the number of activities, the word-focused activities tended to facilitate short-term word retention to a similar extent. This finding is somewhat unexpected. Generally speaking, the learners were expected to benefit from the combination of two activities, and attain much higher scores because they were likely to process the words at a deeper level than those who read and only did one activity. The two-activity condition, therefore, potentially promoted better learning and retention. However, this was not shown to be the case. There may be two plausible explanations. First, it is possible that, when tested immediately after the completion of the reading task, the acquired word knowledge was fresh, available, and accessible in the learners’ memory. Thus, whether students did one or two activities did not make a substantial difference. One activity would have been sufficient. Second, as reported earlier, the immediate-test score of the two-activity group was, albeit non-significantly, higher than the scores of the IMG-only group or the VEE-only group. It is thus possible that if the time span of the experiment had been longer – for example, if the study had allowed more than two experimental reading sessions – the effectiveness of the combination of two activities would have become apparent, or become so powerful that it would have enhanced short-term word retrieval substantially more than both IMG-only and VEE-only groups.

Nonetheless, where longer-term retention is concerned, the two-activity condition did enhance word retention. Reading plus one-activity, particularly the VEE-only condition, seemed insufficient for retaining words over a longer time. The main reason for a superior effect for the combination of two activities over one activity (specially the VEE-only group) is probably that the learners, quantitatively and qualitatively, went through a deeper level of lexical-information processing when they did two activities. Quantitatively, the two-activity condition provided the learners more chances to focus on and process the words, first when reading with gloss, second when doing the exercise. Qualitatively, the combination of two activities enabled the students to process and develop different aspects of lexical knowledge – both productive and receptive. When the students did the IMG in this experiment, they were concentrating on the form-meaning connections, since they had to infer, evaluate, and choose the correct word meanings from a set of options in the IMG. This may have strengthened the receptive aspect of lexical knowledge. When completing the gap-filling exercise, they again deeply processed the lexical items by evaluating the words and meanings before putting them into gapped sentences. This could help to practice the productive aspect of word knowledge, since they needed to write the words down. The comments of a student in the two-activity group exemplify greater in-depth processing level when doing two activities:
This higher quality and quantity of deeper-level of lexical processing induced by doing two activities potentially strengthened word retention, since the recall of the words was considerably reinforced.

To summarise, the two-activity condition induced greater in-depth processing of lexical information. This advantage of the combination of two activities thus helped strengthen memory, resulting in higher word retention, when compared with the one-activity conditions (especially the VEE-only group).

**Reading plus IMG-activity vs. Reading plus VEE-activity**

Despite no significant differences being found between the IMG-only and the VEE-only conditions, initial evidence suggests that whereas the positive impact for the IMG-activity lasted for the longer two-week period, the positive impact for the VEE-activity was noted over the shorter term, but clearly disappeared as time went on.

The crucial factor attributable to a longer-lasting positive impact of the IMG-activity on vocabulary learning and retention is the “deeper processing level”. The IMG-activity can be supposed to have induced deeper lexical processing than the VEE; therefore, it is likely to result in better word retention. The depth of processing induced by the IMG was shown in some of the students’ responses, when asked in the interview which of the two activities was more demanding.
The interviewed participants agreed that the IMG-activity was more demanding; they put greater effort (to infer the word meanings) and spent more time on it.

The next important factor that could make the effectiveness of IMG last longer is the meaning verification format (i.e. type of feedback). The IMG offered immediate meaning verification through the immediate feedback, while the verification of meaning for the VEE in the form of the exercise answer-key checklist was delayed. In other words, when reading with the gloss, the learners were able to check their answers (i.e. their meaning inferences) immediately by clicking on the “Check Answer”. The availability of immediate feedback may engage learners more in the verification process, help reaffirm the word meanings, and reinforce retention. As shown in previous studies (de Bot, 1996; Ferris, 2003; Murphy, 2007), elaborative feedback – a complex form of feedback that explains, directs or monitors (Smith, 1988, as cited in Murphy, 2007) – is more conducive to long-term development because it forces learners to notice, identify, and self-correct their errors. In contrast, the students who did the gap-filling exercise were unable to check their answers until they had completed the entire exercise. The delayed feedback might lessen the power of the process of meaning verification, which is preferably done immediately after making meaning inferences if it is to foster word retention (Grace, 1998; Koren, 1999). Students who did the VEE-activity might therefore lack the opportunity to reaffirm the form-meaning connections.

The interview data suggest that the students who did the IMG agreed on this process of meaning verification with immediate feedback as provided in the IMG-activity.; whereas those who did the VEE doubted the advantage of the delayed feedback available in the VEE-activity. In fact, they were unlikely to actively engage in the process of self-correction.

In other words, the students preferred the immediate feedback to the delayed feedback, because the immediate feedback could interact with them promptly. This interactive feature could help correct their wrong inferences or reaffirm their correct ones. Both facilitated word retention. The non-interactive delayed feedback, on the other hand, failed to enable simultaneous verification leaving the students uncertain about the meanings of the words, which could have obstructed efficient word retention.

To summarise, the provision of the IMG as a supplementary word activity was more likely to enhance vocabulary retention than the VEE, especially where longer-term retention was concerned. This is possibly because the IMG-activity induced deeper lexical processing, and provided immediate meaning verification. These features of the IMG helped strengthen word retention, making it more resistant to word deterioration.
PEDAGOGICAL APPLICATIONS

Some potentially useful implications – for teachers, material developers, teacher trainers, and researchers – can be drawn from the findings of the present study.

One advantage for reading-plus-activity conditions over the reading-only condition may be their pedagogical applications. Generally, EFL teachers may try to include vocabulary activities in their English lesson, since this experiment found that doing something with a word was more effective than simply encountering it. This is because the word-focused activities involved learners more in deep lexical processing. In this way, students are able to simultaneously practice their English skills and learn vocabulary more efficiently.

If possible, the teacher should aim for two activities or more. The study showed that the combination of two activities helped to reinforce word retention, especially over a longer period, suggesting that the more activities, the better the learning. Nonetheless, if many activities are to be included, they need to be carefully implemented in an appropriate way to avoid overwhelming students with information. The teacher could, for example, try to spread the activities across several sessions so that learners are not too exhausted or bored from doing too many activities at a time.

There are various types of activities for which the teacher may opt, depending, for example, on their students’ level and the course objectives. As suggested by the findings of the study, teachers may employ activities that induce a greater degree of involvement. One promising activity that was proven helpful in this study for vocabulary learning was the interactive multiple-choice gloss (IMG).

Teachers can simply include the IMG as a part of classroom activity, for example, in reading classes. Since this study shows that the IMG was potentially beneficial for vocabulary retention particularly over a longer period, it would be unfortunate if teachers fail to make use of it. With the help of the IMG, students tend to be more confident, and find reading English texts enjoyable. Because they enjoy reading; they are motivated to read more in English. The more they read, the more opportunities they have to practice and improve their language skills – a virtuous cycle that is surely the ultimate goal of language learning.

The use of the IMG in the classroom may also help to reduce the workload of teachers, since students are able to learn more independently. They can check their answers with the interactive immediate feedback, for example. This could free up the teacher to circulate around the classroom while students work in partial independence. This helps to generate a win-win situation: the teacher does not have to give feedback to every single student – which is virtually impossible – and students do not have to rely only on the teacher, or feel ignored when they cannot reach the teacher due to the large size of the class.

The IMG-activity can be implemented as distance learning. The use of the IMG could be very helpful, particularly in a context where there is a limited number of teachers of English. The use of the IMG may help minimise such a problem. When students read with the IMG, teachers do not have to be present to give feedback (correct answers) to students, since the immediate feedback option incorporated in the IMG can help them verify their meaning inferences by themselves. Thus, learners, especially those in a remote area where a lack of teachers of English is a major problem, are still able to practice their reading skills and enlarge their vocabulary repertoire with this distance-learning tool.

To summarise, the study supports the benefits of text-based word-focused activities in enhancing incidental vocabulary learning and retention. The findings are particularly beneficial
for teachers, researchers, and material designers whose ultimate goal is to help L2 students to learn vocabulary efficiently.

LIMITATIONS AND DIRECTIONS FOR FUTURE RESEARCH

Empirical research always provides a basis for identifying potential developments, both in substance and method (Hulstijn, 1997). The current research has encountered certain inevitable limitations as such the number of participants, the time span of the experiment, or the lexical knowledge aspect. These constraints should be borne in mind in order to avoid any overgeneralization of the findings and to identify plausible directions for further research. The directions the future research might take are:

• Future research could implement the activities in the context of taught programmes, examine the effects and investigate how students engage with the activities in real learning contexts.
• The implementation of a think-aloud protocol could be considered in order to enable an in-depth investigation into whether learners process the same words in similar or different ways when engaged in the four different reading conditions.
• Word retention over the long term is an important area that merits future investigation since it would allow researchers to study the development of lexical knowledge more clearly, in greater depth, and arguably with greater validity.
• Future studies could usefully replicate this study with larger populations and with students of different proficiency levels, since the different activities may differentially interact with the levels of proficiency.
• Future research could examine other aspects of word knowledge, such as word association, pragmatic knowledge, or aspects of productive vocabulary use. For instance, it is possible that using the VEE-activity might prove to be more beneficial for the development of productive knowledge than using the IMG activity, or vice-versa. There is also the possibility that more advanced lexical knowledge, such as collocation, may be achieved when words are repeatedly encountered.
• A further fruitful area for future investigation might be the incorporation of other forms of annotations (different types of multimedia – pictures, motion pictures, or sounds) into the multiple-choice gloss.
• Other types of reading-based exercises, such as crosswords, true-false activities, or sentence-writing activities, or keeping vocabulary notebooks, could be used to see what their effects on vocabulary learning are.
• Future experiments recording the time used by the students to process each lexical item – if possible with respect to different reading conditions – would provide a clearer understanding of the relationships between word types, activity types, and time spent. This in turn would help us to study the efficacy and the efficiency of lexical knowledge development in relation to different reading conditions.

CONCLUSION

This study was conducted to shed light on incidental vocabulary learning in L2 computer-mediated reading, with particular reference to the effectiveness of text-based vocabulary activities. It shows that vocabulary can be learned incidentally through reading. However, the
gains were varied, depending on the particular reading conditions in which the students were engaged. That is, the vocabulary gains obtained from reading alone were relatively small, while gains from reading plus word-focused activities were much higher. The combination of two activities seemed more beneficial for word retention, while the interactive multiple-choice gloss (IMG) was potentially more productive than the vocabulary enhancement exercise (VEE). In other words, supplementary word-focused activities facilitated incidental word learning and retention. It is theorised that the activities provoked a higher level of vocabulary engagement and a deeper level of processing. The activities encouraged learners to process the form-meaning associations of the words deeply and elaborately, thereby enhancing word retention. The findings, which support the positive impact of reading and doing word-focused activities should encourage teachers to incorporate activities or exercises into reading classrooms, or as outside-classroom self-learning activities. The interactive multiple-choice gloss has proven beneficial for vocabulary retention in this study.

Understanding the complex process of word learning is very much like completing a vast jigsaw puzzle. Several questions have yet to be answered. This study has attempted to fill in some missing pieces. Although a single study cannot hope to answer all the interesting questions, it is hoped that it has made a small but significant contribution to our understanding of vocabulary learning. The findings that it has generated will not be of use, however, unless they are implemented. Teachers, researchers, developers of teaching materials, and others involved in language learning and teaching should consider putting these findings into practice in order to help students expand their vocabularies and improve their comprehension and expression in the target language.

REFERENCES


42. Laufer, B. (1997). The lexical plight in second language reading: Words you don't know, words you think you know, and words you can't guess. In J. Coady & T. Huckin (Eds.), *Second Language Vocabulary Acquisition* (pp. 20-34). Cambridge: Cambridge University Press.


APPENDIX A: SCREEN SHOT OF THE READING PROGRAMME (WITH OR WITHOUT GLOSS)

I. Screen shot of the reading programme without the interactive multiple-choice gloss (IMG)

II. Screen shot of the reading programme with the interactive multiple-choice gloss (IMG)

Students click on the highlighted words. The multiple-choice gloss then pops up on the right-hand margin.
Students infer the meaning and choose from the three alternatives.

Students can check the inferred meaning with the immediate feedback.

If the meaning inference is wrong, students need to try again.

If the meaning inference is right, students can continue reading the passage.
APPENDIX B: SCREEN SHOT OF THE VOCABULARY ENHANCEMENT EXERCISE (VEE)

Name: ??

Instructions: There are 4 sets of exercises. Complete each of following gaps with the most appropriate word from the left column of the list. Each word can be used only once. You may need to adjust the form of the word to suit each context. (จะเห็น
คำศัพท์ที่เหมาะสมลงในช่องว่าง โดยเฉลี่ยจากคำศัพท์เหล่านี้ หนึ่งเดียวให้ทางด้านล่างที่มี
คุณสามารถใช้คำศัพท์เหล่านี้แต่ตัวอย่างเงื่อนไขเพียงบางอย่างเท่านั้น)

Started Time (เวลาเริ่มต้น): ??

Set 1:

<table>
<thead>
<tr>
<th>Word</th>
<th>Part of Speech</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent</td>
<td>Adj.</td>
<td>ใกล้เคียง, ใกล้กัน</td>
</tr>
<tr>
<td>Crucial</td>
<td>Adj.</td>
<td>สำคัญ, จำเป็น</td>
</tr>
<tr>
<td>Potential</td>
<td>Adj.</td>
<td>สามารถไปได้</td>
</tr>
<tr>
<td>Random</td>
<td>Adj.</td>
<td>เกี่ยวกับการลงทุน, ไม่แน่นอน</td>
</tr>
</tbody>
</table>

1. The accident reminds us about the ________ dangers involved in North Sea oil production.

2. Parents play a/an ________ role in preparing their children for the future.

Students perform the exercise by filling the gapped sentences with appropriate words chosen from the list.
Students are given the answer key in order to verify their answers.