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**EXPLICIT SECOND LANGUAGE VOCABULARY LEARNING: AN INVESTIGATION
OF A GLOSS-EMBEDDED TEXT PLUS FORM, MEANING, AND USE EXERCISES**

A Dissertation in

Applied Linguistics

by

Jean Louise Ferguson

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The dissertation of Jean Louise Ferguson was reviewed and approved* by the following:

Paula Golombek
Senior Lecturer, Linguistics and Applied Language Studies
Dissertation Advisor
Chair of Committee

Karen Johnson
Professor of Applied Linguistics

Susan G. Strauss
Associate Professor of Applied Linguistics

Peggy Van Meter
Associate Professor of Educational Psychology

Robert Schrauff
Director of Graduate Studies
Associate Professor of Applied Linguistics

*Signatures are on file in the Graduate School

ABSTRACT

The present study attempted to determine whether English vocabulary words can be explicitly taught and effectively learned through interaction with an experimental reading-based, gloss-embedded text plus interaction with form, meaning, and use vocabulary exercises, and whether this approach would lead to higher retention rates compared to a more conventional vocabulary-learning approach involving a text plus dictionary use plus an opportunity to write on a related topic. Results show that the experimental condition had a significant positive effect on the immediate but not the delayed vocabulary posttest performance. Activation of glosses, prior knowledge, motivation, and educational level did not significantly affect performance. IEP level (placement in language learning classes) and L1 had mixed effects on performance. No relationship was found between participant group and ratings of treatment helpfulness. Limitations of the study and directions for future research are also discussed.

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Chapter 1

Introduction

1.1 Interests in Second Language Vocabulary Learning

Research on second language vocabulary learning and its underlying processes were, until the 1990s, largely neglected in favor of syntax and morphology. Vocabulary has remained largely unstudied because 1) many teachers and researchers believe word learning will occur naturally through reading and other interactions with the language (Nation, 1990), and 2) too many words exist to teach (Nagy, 1997). Some characteristics of vocabulary learning that distinguish it from other aspects of language learning are that it is incremental, successive, potentially limitless, and heavily bound by the learner's experience (Nation, 1990; 2001). The fact remains, however, that many words must be learned to become proficient in a second language. As a result, research interest in vocabulary learning has increased because both learners and researchers consider it to be one of the most important elements in second language learning (Nation, 1990; Willing, in Nunan, 1995).

Widdowson (1978), for instance, claims that native speakers can better understand non-native ungrammatical utterances with accurate vocabulary than utterances with accurate grammar and inaccurate vocabulary. Just one unfamiliar word can render an utterance incomprehensible, and therefore, makes vocabulary learning crucial (Witrock, Marks, & Doctorow, 1975). If vocabulary learning can be made more effective, efficient, and interesting with the aid of theory-based learning principles, whether in or out of the classroom, learners may make more rapid, satisfying progress and achieve a greater degree of proficiency in the target language. This study

attempts to address this issue by investigating the potential of a vocabulary learning treatment in helping learners build vocabulary knowledge.

1.2 The Importance of Vocabulary for Language Learners

To communicate effectively, a sizeable vocabulary is needed. Functional language proficiency requires the knowledge and use of thousands of words to comprehend and produce oral and written texts. Nagy and Herman (1987) found that native English speaking high school seniors had, on average, a 40,000 word vocabulary. Logically, then, English language learners have much work to do to learn a similar number of words to become proficient in academic English, the distinctive type of English used in academic texts and classrooms as well as professional settings (Jiang & Kuehn, 2001). Whether language learners study to build language proficiency in their home countries or in the U.S., in formal academic settings or in their own homes, learners need to undertake the difficult task of building a sizeable English vocabulary numbering in the thousands. The question is, how should that vocabulary be built?

First (L1) and second language (L2) vocabulary learners have different needs; therefore, the L1 model of vocabulary learning should not be followed for L2 learners. In first language research, the debate concerning whether it is worthwhile to teach vocabulary explicitly continues. Nagy (1997) thinks that it is unnecessary, specifically because 1) the large number of words in English and the large amount of time needed to effectively teach them are prohibitive, and 2) because of the time needed, direct teaching can only account for a very small proportion of native speakers' vocabulary growth. Native speakers have numerous opportunities to learn from input and to produce output at an appropriate level, whereas non-native speaking learners have fewer opportunities, especially if they are learning language in a classroom, and more specifically, if they are learning in a foreign-language setting.

Second language learners at the post-secondary level whose goal is to use academic English need to learn large numbers of words in a relatively short period of time, yet some second language teachers argue against the inclusion of vocabulary instruction during class time both because of the size of a language's lexis and because of the belief that learners will "pick up" vocabulary as part of the language learning process (Nation, 1990). Although this perspective is understandable, the L1 model of natural, largely incidental vocabulary learning is not practical because meeting the great number of necessary words in natural, authentic contexts simply takes too long (Groot, 2000).

Two further reasons for the distinction between L1 and L2 learner vocabulary needs exist. First, a distinction can be made between high- and low-frequency words. Native-speaking children begin school with knowledge of the high frequency words and require growth in the low-frequency words. However, second language learners need to learn the high frequency words, which constitute a rather small proportion of English words, yet account for over 85% of words in most written and oral texts. For native speakers, then, the argument against vocabulary instruction is for low-frequency words, not high-frequency words; whereas for non-native speakers, direct instruction of a relatively small number of rather important high-frequency words is cost effective. Second, direct teaching can add to further incidental learning of words on subsequent encounters by raising awareness of them and adding small amounts of extra information about the form, meaning, and use to learners' existing knowledge (Nation, 2001).

Arguments against spending classroom time on teaching vocabulary may not be valid for non-native speakers because of their need to learn a large number of words in a short period (Groot, 2000). There are comparatively few head words (roughly 2,000) needed to increase proficiency levels to allow for learning from un-simplified input, and the direct teaching of vocabulary has shown to be an effective and efficient way to teach relatively large numbers of vocabulary words (Nation, 1990; 2001). A reasonable conclusion to draw from the research,

then, is that second language learners must be taught some of the most frequently used vocabulary because they are not likely to learn it incidentally in great enough quantities or with great enough speed to help them communicate effectively.

1.3 Vocabulary: How Many Words Are Needed?

Developing a vocabulary that allows language learners to function well in English across a number of situations presents a challenging task. Research has demonstrated that learners need both receptive and productive knowledge of thousands of words for successful communication (Nation, 1990; Nation 2001). To illustrate the breadth of a sufficiently-sized vocabulary, Nation (1990; 2001) indicates that 2,000 high frequency word families allow learners to understand approximately 87% of any given written or oral text (Nation, 2001). These words are compiled in the General Service List of English Words (West, 1953) and are essential to any language learner studying English. However, 2,000 word families do not build a large enough vocabulary to understand non-specialized academic texts because even with an understanding of this proportion of words, 13% of what may be crucial information is not understood. For input to be understood, and new vocabulary recognized, learners should already be familiar with 95% of the running words included in the input. If a greater proportion of unknown words exists, learners may not comprehend enough of the meaning of the text or learn new words from context (Nation, 2001). To understand more, a learner must acquire a more sizeable vocabulary. For this, Laufer and Shumueli (1997) suggest that 5,000 word families are the minimum necessary; Groot (1994, in Groot, 2000) argues for a vocabulary base of 7,000 word families, and Hazenberg and Hulstijn (1996) argue that an even greater number, 10,000, word families are needed. Beyond this base vocabulary, Nation states that another 800 academic word families are included in the University Word List and constitute about 8% of the running words in academic texts (1990). An additional

1,000 to 2,000 technical vocabulary words for *each* subject area represent another 3% of the running words in specialized texts. Finally, the remaining 2% of words consists of roughly 123,000 low frequency words (Nation, 1990). Keeping the number of unknown words to a minimum increases the probability that the unknown words will either not be necessary for comprehension, or when they are needed, that their meaning may be guessed from context. The benefit for learners of a larger vocabulary is that comprehension and comprehensibility are both increased.

1.4 Incidental Vocabulary Learning

Learning vocabulary incidentally through reading has both benefits and shortcomings. Incidental, reading-based vocabulary learning refers to word learning which occurs as the result of attempts on the part of a learner to comprehend a reading passage, and it can be fragile. Gains in word knowledge from reading for comprehension may be unpredictable and incomplete, so sole reliance on extensive reading as a means of vocabulary expansion is a questionable instructional strategy. Incidental acquisition of words through reading may only be possible up to a point for second language learners because the words may not occur often enough in authentic texts (Groot, 2000). Even careful text selection that ensures repeated exposure to target words may not result in incidental learning. It may instead result in inaccurate learning or in recognition without the information necessary for production (Wesche & Paribakht, 2000).

During incidental vocabulary learning through reading, learners may consult dictionaries or glosses to find the definition of unknown words so that the overall text may be better understood; however, word learning is not, in itself, the goal. One of the benefits of incidental vocabulary learning is that vocabulary words may be met through repeated exposure in a variety of contexts. This is beneficial because vocabulary learning is not an all-or-nothing event for any

particular word (Nation, 2001). It is, instead, a process of honing word knowledge. Each encounter serves to add to the learner's knowledge of a word's form, meaning, and use.

Contextualizing word learning assists learners in understanding different aspects of words.

Learners' implicit understanding of words may be changed slightly, dramatically, or reinforced with each encounter, as well as adding or subtracting small amounts of information to what is already known. This helps the learner to develop a richer, deeper understanding of the word.

Groot (2000) argues, however, that the reliance on reading alone as a means to expand learner vocabulary is not effective for second language learners because incidental learning takes too long. Words may be met too infrequently for honing to occur because learners may have forgotten previous instances of words by the time they meet them again. Additionally, millions of words may need to be read in order to make a sufficient number of encounters that result in word learning.

The use of dictionaries and guessing assists in situating vocabulary learning in the context of reading and goes beyond the incidental vocabulary learning that often results from encounters with words during reading. However, like learning vocabulary from lists and incidental learning through reading, these approaches also have their shortcomings. The following sections illustrate some reading-based vocabulary learning approaches, or means of learning that attempt to provide learners with vocabulary learning opportunities by exposing them to authentic texts.

1.4.1 Dictionary Use

Dictionary use is commonly encouraged by teachers because it is thought to increase comprehension of texts and lead to vocabulary learning. This belief is both correct and incorrect. Dictionary use can positively affect vocabulary learning when they are actually used and when they are used accurately, but mixed results have been found regarding their long-term effectiveness. Luppescu and Day (1993) studied the effect of the use of bilingual dictionaries on

vocabulary learning while reading. They found that learners who used a dictionary scored better on an immediate vocabulary post-test than those who did not. They also found, however, that the dictionary users answered some of the questions inaccurately more often than non-dictionary users. This appears to have happened when words had several definitions, and learners selected the wrong ones, which suggests that learners' dictionary use skills were lacking.

Other studies have examined the use of computer-based dictionaries (Hulstijn, 1993; Knight, 1994). This format allows each word search to be electronically recorded. Knight (1994) found that learners who had access to dictionaries performed better on both immediate and delayed vocabulary post-tests than those in the non-dictionary condition. In addition, learners in the dictionary condition outscored non-dictionary users on a test measuring comprehension. Low-ability learners benefited the most from dictionary access, with scores almost as high as the high-ability, dictionary-access learners.

Although effective, Luppescu and Day (1993) and Knight (1994) determined that those in experimental conditions involving the use of dictionaries require up to twice as much time to complete tasks than those in the non-dictionary conditions. Dictionary use can be effective; however, most learners in the dictionary condition failed to use them often for texts over one page in length or for texts they did not perceive as important or interesting. Although the use of dictionaries may enhance vocabulary learning, and by extension, text comprehension, they may only do so when learners are sufficiently motivated to expend the effort to use them (Gettys, et al, 2001; Hulstijn, et al, 1996).

Dictionary use does have some benefits for vocabulary learners as demonstrated by vocabulary learning on posttests, but the amount of time it takes to use dictionaries can be prohibitive. Learners under natural rather than experimental reading conditions, then, may not be motivated or have time enough to look up all unknown words, even if doing so will increase comprehension and lead to greater vocabulary knowledge.

1.4.2 Glossing of Vocabulary

Because learners may opt not to use dictionaries, it is worthwhile to examine an alternative to dictionary use: glosses and their effect on vocabulary learning. The usefulness of several types of glosses is well established. They have proven to be useful in focusing attention, providing multiple exposures to words, encouraging depth of processing, being effective in various positions in the text, and at times, improving reading comprehension and vocabulary learning.

The use of glosses as aids to vocabulary learning and text comprehension has been studied to determine their effectiveness (Nation, 2001). In order for vocabulary learning through reading to occur, unknown words are sometimes glossed in texts for second language learners in order to provide brief definitions. In some texts, glosses are signaled by bold letters, italics, or underlining, which serves the dual purpose of reducing learner confusion, if the definition follows immediately, and drawing learner attention to to-be-learned words. Researchers such as Gass (1998), Schmidt (2001), and Watanabe (1997) suggest that attention is crucial to learning. In all gloss conditions, the gloss drew attention to the word and encouraged learners to view the word as something to be learned and not just as part of the text (Watanabe, 1997). The benefits of glosses are fourfold: 1) they allow learners to read texts that may otherwise be too difficult; 2) they provide accurate meanings for words that may not have been guessed correctly; 3) they can, but do not always, provide only minimal interruption during the reading of a text; and 4) they draw attention to words and encourage learning.

In studies focusing only on reading comprehension and not on vocabulary learning, the effects of glossing have been mixed. Watanabe (1997) noted a positive effect of glossing on open-ended reading comprehension questions, but Myong (cited in Nation, 2001) and Jacobs et al. (1994) detected no effect of glosses on comprehension. The lack of consistent results in glosses' ability to aid comprehension may be an artifact of experimental designs, which may be

explained by word density; published research has utilized texts incorporating 5% or fewer unknown vocabulary words. Laufer (cited in Nation, 2001) provides evidence indicating that texts in which 95% or more words are known are adequately comprehensible. Glossing may have a greater effect on comprehension in texts in which more than 5% of words are unknown. A potential danger exists when learners interact with vocabulary-dense texts. They may be overwhelmed by the sheer volume of unfamiliar vocabulary words. Especially when learners have no particular stake in the reading, they may opt to ignore unfamiliar words. Overlooking novel vocabulary in a text that contains many unfamiliar words potentially impairs comprehension. If readers have no stake in the interaction with the text, even given text-embedded glosses (definitions), they may become too fatigued, frustrated, overwhelmed by information, or lazy to utilize the glosses to learn the meaning of the unfamiliar words or to attempt to comprehend the passage.

The use of glosses can affect both reading comprehension and vocabulary learning simultaneously. Hulstijn et al. (1996) determined that comprehension and incidental vocabulary learning increase with access to L1 glosses and dictionaries. Among L2 learners, Davis (1989) found that glosses aid in the recall of significantly more of the text and ensure more fluent reading, and Knight (1994) reported that the use of dictionaries improves vocabulary learning. (Chun & Plass, 1996; Hulstijn, Hollander, & Greidanus, 1996; Jacobs, Dufon, and Hong, 1994; Myong, 1995, cited in Nation, 2001; Watanabe, 1997). Learners in two conditions, one with glosses and one without, did not differ on items correctly translated on a vocabulary post-test, but those in the no-gloss condition inaccurately translated more items; this finding suggests that a lack of glosses may have led to incorrect guesses from context (Hulstijn, 1992, cited in Nation, 2001). When research focuses on comprehension, however, vocabulary learning is incidental, and learning gains are not great (Hulstijn, 1992, cited in Nation, 2001). Learners do not seem to show a preference for either the L1 or the L2 in glosses, as long as they are simple enough to be

understood. Jacobs, Dufon, and Hong (1994) uncovered no difference between the language of glosses in their effect on reading comprehension and vocabulary learning. However, Myong (cited in Nation, 2001) reported that the use of L1 glosses resulted in better vocabulary learning. They did not differ from the use of L2 glosses in their effect on reading comprehension.

The use of glosses in vocabulary learning-only studies has been found to enhance incidental learning when compared to non-gloss conditions (Hulstijn, 1993; Hulstijn, Hollander, & Greidanus, 1996; Jacobs, Dufon, & Hong, 1994; Knight, 1994; Laufer & Shumueli, 1997; Mondria & Wit de Boer, 1991; Paribakht & Wesche, 1996, 1997; Watanabe, 1997). Chun and Plass (1996) found that 25% of annotated (glossed) words were remembered incidentally. While learners in a marginal gloss condition performed twice as well as those in a dictionary condition (Hulstijn et al., 1996), when learners in the dictionary group actually used their dictionaries, recall was greater than even the marginal gloss group (Hulstijn et al., 1996). Similarly, Gettys, Imhof, and Kautz (2001) compared L1 dictionary glosses to sentence-level translations and found the dictionary glosses to be more effective.

Glosses can be beneficial in leading to improved text comprehension and incidental vocabulary learning. Although they can be beneficial, they have not consistently been found to lead to improved comprehension in vocabulary-dense texts or to vocabulary learning. Finally, because the use of glosses typically results in incidental learning, they alone, like dictionaries alone, are not sufficient as the primary means of vocabulary learning.

1.5 Explicit Vocabulary Learning Through Reading Plus Exercises

If the information learned about a word through dictionary use or glossing is not reinforced within a critical period of time, that learning, because it was incidental rather than intentional, may be lost. New information must be processed to a certain depth if it is to be stored

in long-term memory and linked to related words and concepts. Therefore, second language learners should not rely solely on learning vocabulary from context.

Although the use of reading for the development of vocabulary may lead to the recognition of a large number of words in context, it does not typically ensure the development of the multi-faceted knowledge necessary to produce the words correctly (Paribakht & Wesche, 1997). In other words, it may lead to passive vocabulary learning, but not to the active, explicit learning, rich with knowledge of form, meaning, and use necessary for production. The complex process of learning the many aspects of a word illustrates the need for repeated and diverse mental processes over time, which cannot necessarily result from multiple exposures while reading for comprehension rather than for vocabulary development because passive interactions with vocabulary embedded in text may not result in an adequate amount or depth of processing. Therefore, intentional, direct teaching of vocabulary, coupled with interactive, active exercises is also important (Nation, 2001).

Although the goal of reading is, indeed, usually comprehension, research indicates that words encountered in texts can be learned incidentally, resulting in the acquisition of passive vocabulary knowledge, or the recognition and comprehension of words. When vocabulary exercises which require interaction with new words are intentionally added to texts, however, both passive and active vocabulary gains may be made, thus extending learners' abilities not only to understand, but also to produce the new vocabulary. Language-focused, intentional attention to such features of the text provides fruitful opportunities for intentional learning of vocabulary during reading exercises (Nation, 2001).

Fraser (1999) determined that learners almost doubled their retention of vocabulary word meanings inferred from context when those inferences were followed by consultations with a dictionary. Paribakht and Wesche (1993) observed that learners in an explicit-focus reading plus vocabulary exercises group outperformed learners in a repeated opportunities group in which

learners encountered the same words many times in different readings even when researchers attempted to equate the time spent in each group. Learning was explicit, as participants were aware they would be tested on comprehension and vocabulary at the end of each activity. While both approaches resulted in vocabulary learning, the vocabulary plus exercises group learned more words than the reading only group. In addition, superior results were found when contexts with definitions were compared to synonyms or short definitions, a classification task, or the use of a dictionary alone (Gipe & Arnold, 1979). These findings show greater learning under conditions involving explicit focus on vocabulary while reading.

1.6 Summary

Reading tasks that encourage the learning of vocabulary come in many forms: incidental learning through reading, dictionary use, glosses, and exercises designed to accompany readings. The tasks range from passive to active vocabulary learning, and lead from recognition, to recall, to the potential for production. Because all of these tasks are likely to be employed by learners throughout the language learning process, it is important that their respective effects on learning are known.

Incidental learning from reading alone does not lead to the kind of long-term, multi-faceted vocabulary knowledge that second language learners need to develop advanced communication skills. Incidental vocabulary learning, contextualized within readings along with dictionary and gloss use, may help learners to develop vocabulary, but only slowly, incompletely, and incrementally. The addition of exercises to reading-based (contextualized) vocabulary exposure can address the shortcomings of reading only, reading plus dictionary usage, or reading plus gloss usage learning conditions. Combined approaches show promise in being more effective, efficient, and comprehensive than either approach alone, but the quality of the exercises

and whether or not they address a fuller spectrum of word knowledge may determine just how effective a reading plus vocabulary exercise condition can be for vocabulary learning.

1.7 The Present Study

Clearly, research is needed to help increase the effectiveness and efficiency of vocabulary learning. Specifically, because of the importance of vocabulary to overall language proficiency, vocabulary learning would benefit from a greater understanding and application of approaches that have the most beneficial impact on learners. An investigation into an effective, research-driven approach to vocabulary learning that addresses the issues, to be discussed in detail in chapter two, of word knowledge, learning components, conditions necessary for vocabulary learning, and vocabulary delivery appears to be in order.

The present study attempts to address the needs of vocabulary learners by investigating the effectiveness of the combination of a glossed, reading-based text plus interactive exercises that focus learners' attention on the form, meaning, and use of to-be-learned words on the immediate and delayed recognition and recall of vocabulary words. The study hopes to contribute to the knowledge of how to help language learners to learn second language vocabulary in an effective, efficient manner.

Chapter 2

Review of the Literature

2.1 Introduction

Second language learners must undertake the difficult task of learning thousands of vocabulary words to become proficient communicators. To understand how word learning occurs so that vocabulary instruction may be improved, thus reducing the learning burden, the investigation of learning new vocabulary words should attend to matters such as what it means to know a word and the types of activities that promote the acquisition of word knowledge. To achieve this end, the review of the literature contained in this chapter covers the constituents of word knowledge, the conditions necessary for vocabulary learning, and some effective vocabulary delivery methods. This chapter provides the foundation upon which the present study is based and overviews the conditions necessary for vocabulary learning, as well as the technologies that support vocabulary learning.

2.2 Word Knowledge

Many aspects of a word need to be known in order to have the ability to use it accurately, strategically, and appropriately, but what exactly needs to be known, and how that knowledge is defined remain elusive. The definition of what it means to "know" a word is varied. An operational definition of "knowing" a word may be viewed in terms of a continuum ranging from a vague sense of recognition of its spelling or pronunciation to a correct knowledge of its semantics, syntax, or use, or appropriate, contextualized production (Nagy & Herman, 1987).

Given that learners need to know thousands of vocabulary words in order to comprehend oral and written texts, as well as to produce texts, vocabulary learning is clearly an important topic in the development of language proficiency. Vocabulary instruction, already shown to be vital to L2 learners, can be more effective if the components of word knowledge are identified and understood.

Most research on word knowledge has focused on the knowledge of word meaning. Word knowledge includes knowledge of both the concept and of the label applied to that concept (Frankel, 1989). In L1 learning, a word label and the underlying concept are learned concurrently, whereas in L2 learning, a new label is usually attached to an already-known concept or may be integrated into an already-existing conceptual framework (Groot, 2000). Learning new labels for words presents a greater difficulty for learners than learning meaning (concepts) because a great deal of shared knowledge of meaning exists across different languages (Groot, 2000; Nation, 2001). Although words in different languages may not share precisely the same meaning, most often, the commonalities in meaning exceed the unique features.

2.2.1 Form, Meaning, and Use

There are other aspects of "knowing" a word. For the purposes of the present research, "knowing" consists of several elements. At its most fundamental level, knowing a word includes understanding form, meaning, and use (Nation, 2001). Knowledge of the spoken form of the word is procedural knowledge, the knowledge of how to create the structure of the word and includes how it sounds and how it is pronounced. The written form includes what it looks like, how it is written, and how it is spelled. Knowledge of the parts of the word form include elements of the word that are recognizable (e.g., roots and affixes) and which parts are necessary for the expression of the intended meaning (Nation, 2001). Learning the form of the word involves implicit learning that includes noticing. This may be achieved through repeated

encounters with the word during reading in a variety of contexts as a means of developing vocabulary knowledge.

Nation's (2001) vocabulary knowledge element of meaning is declarative (Levitt, 1989), which is the knowledge of "what" a word is, including its meaning, form, concept, referents, and associations. Knowledge of meaning includes the relationship between form and meaning and necessarily involves an understanding of the meaning that a word form denotes and what word form is used to express the intended meaning. To know a word, it is necessary to understand what is included in the concept and what items the concept refers to. The associations that the meaning of a word conjures are also important. Other words linked in the knowledge network help to deepen knowledge of meaning and allow for word substitutions. Knowledge of the meaning of a word can be gained through explicit learning by stimulating depth of processing through the use of images, elaboration, or inferencing.

The vocabulary knowledge element of use is conditional, or metacognitive, knowledge. It is the knowledge of "why, when, or where," or under what conditions, a word may be used. To use a word correctly, learners must have a knowledge of collocations, which are the words that often appear with the word to create distinct meaning. This knowledge includes what other words or types of words *can* appear with the known word, as well as knowledge of what words or types of words *must* appear with the word (Nation, 2001). This may be learned implicitly through repeated exposure to the word or explicitly through instruction.

Knowing the constraints on the use of the words may also be crucial. Frequency and register (level of formality) affect how words are used. Learners must comprehend where, when, and how often the word may be met or used. Constraints on the use of words are best learned explicitly, through the use of instruction, guidance, and feedback (Nation, 2001).

Conditional knowledge, or *use*, is a critical determinant of whether maintenance and transfer of knowledge of a word will occur. It is, however, a topic that is often overlooked in

vocabulary instruction, materials, and research (Nation, 2001). Merely possessing this type of knowledge does not guarantee that words will be used appropriately. The absence of this type of knowledge can lead to learner errors, confusion, frustration, and at times, expulsion from a learner's productive vocabulary.

2.2.2 Honing Word Knowledge: The Need for Multiple Encounters

Given all that is necessary to "know" a word, Nation (2001) believes that a word is not fully learned after only one encounter with it, even with substantial deliberate teaching. His reasons for this are threefold:

1. There are numerous things to know about a word, such as its form (spoken, written, and the stem and its component affixes); its meaning (the underlying concept, particular instantiations, and associations); and its use (collocations, grammatical patterns, and constraints on use).
2. There are four strands through which knowledge of a word needs to develop: through meaning-focused input, direct study and teaching, meaning-focused production, and fluency development activities.
3. Learners can only manage a limited amount of information at any given time (p. 82).

Because there are multiple factors involved in word learning, one can expect only a limited amount of information to be learned in a single encounter. As a result, small, positive steps in learning are natural and to be encouraged, rather than criticized as inadequate. In light of this, direct communication of definitions is not a practice to be criticized, but rather to be commended as a useful and worthwhile step in the cumulative process of learning a word.

2.2.3 Recognition vs. Recall (Passive vs. Active Vocabulary)

The distinction between passive and active vocabulary is an important one (Corson, 1983, in Nation, 1990; Nation, 1990). These two types of vocabulary are important to learners because the difference in knowledge affects how the words may be used. The distinction is also important to researchers because the two types point to different levels or depths of word knowledge.

Nation (1990) states that learning to recognize a word is easier than producing it, reporting an

estimate that word production is 50-100% more difficult than recognition. Finally, the distinction between passive and active vocabulary is important to testers because on recognition test items, such as multiple choice, learners may be able to make the correct choice with only partial knowledge of the word (Nation, 2001); thus providing evidence that recognition of words is easier than recall. Word knowledge, then, is related to form, meaning, use, depth of processing, and retrieval.

A learner's knowledge about the form, meaning, and use of a word is stored in long-term memory for later retrieval and use. However, difficulties may arise in the use of words because differences exist in the quality of the initial knowledge stored as well as the completeness of the retrieval. These differences impact what learners are able to do with that knowledge. In short, it affects whether they are able only to recognize the information or to operate on the more complete knowledge necessary for recall.

Recognition is referred to as passive vocabulary, which is met during meaning-focused input, when words are encountered that can be recognized and understood while listening or reading, but not necessarily produced accurately. Corson (1983, in Nation, 1990) describes passive vocabulary as words which are only partly understood and are not well known enough to use actively and are not needed in daily communication. Words may remain in the passive portion of the vocabulary until the time when they become necessary more frequently, in which case, they may become part of the active, or productive, vocabulary.

Recall refers to active vocabulary, which includes the passive vocabulary described above, in addition to those words that learners believe they know well enough to produce appropriately in speech or writing. The meaning-focused output of newly-learned vocabulary words allows learners to advance their vocabulary knowledge via opportunities to produce meaningful language through speaking and writing activities (Nation, 2001). Retrieval of a word from the mental lexicon in long-term memory for production requires that the word be strongly

connected to other related words and concepts; thus requiring a greater depth of processing for encoding and greater effort for production than that required for receptive, or passive use, of the word (Crothers & Suppes, 1967; Groot, 2000; Stoddard, 1929). In sum, during most stages of learning, the size of the passive vocabulary is greater than the active vocabulary.

2.2.4 Summary of Word Knowledge

Word knowledge is comprised of many elements including labels and concepts; as well as form, meaning, and use; the necessity of multiple encounters to hone meaning; and retrieval in the form of recognition and recall. The relationship between different types of knowledge and the differences between the amount and depth of knowledge necessary for the recognition vs. recall of information helps to explain how and why vocabulary learning is such a complex process. This relationship also helps to explain how Nation's (2001) elements of word knowledge (form, meaning, and use) are truly essential to vocabulary learning.

2.3 Conditions Necessary for Vocabulary Learning

Many facets of words need to be known for their accurate and effective use in the comprehension and production of language. Meeting the words in a variety of contexts and using them to express ideas provide some of the most important opportunities for vocabulary learning (Nation, 1990). Often, and especially when the classroom is the main source of interaction with the second language (L2), learning is limited if teachers do not use challenging ways to draw learners' attention to words and encourage interaction with them (Nation, 1990).

Because so much is involved in learning vocabulary, an understanding of how humans learn would help teachers teach and learners learn more effectively. The form, meaning, and use components of words must be learned, and vocabulary, along with all other learning, may be explained by situating it within human learning theory. Understanding how new information

passes through the various stages of memory and becomes stored in long-term memory is important to an understanding of learning and retrieval. In addition, an awareness of some of the other factors that support the learning of new words is important to teaching, learning, and materials development and delivery.

Information processing theory provides an explanation of how humans learn. According to Gagne, Yekovich, and Yekovich (1993), to be learned, new items of information must pass through three stages: the sensory register, short term memory, and long term memory. After information enters the sensory register, it must be attended to in order to move to the next step of processing, the short term memory. If the information is manipulated and processed to a sufficient depth in short term memory, it can proceed to long term memory, where knowledge is organized into networks based on the formation of relationships between new and old information. Once information is stored in long term memory, it may be retrieved for use, provided that learners use appropriate retrieval cues capable of locating the stored information. This brief description of information processing helps shed light on how humans learn new information, make connections between various pieces of information, and retrieve it when needed. These elements affect all human learning, including the topic of interest in this paper: second language vocabulary learning.

To help learners learn vocabulary more effectively and efficiently, chapter one described why reading alone, reading plus dictionary use, and reading plus gloss combinations were not effective enough to be the sole means of vocabulary instruction, and provided the rationale behind the promising possibilities for enhanced vocabulary learning through a combination of glossed reading texts and explicit vocabulary exercises. For the explicit exercises to be effective, a number of learning components are needed to encourage and support the full processing of information in order to result in the recognition and recall of vocabulary knowledge for use in communication.

The learning components that promote vocabulary learning assist in connecting new to old information in short-term memory to be stored and later retrieved from long-term memory, provided that the information has been processed to a sufficient degree of depth. In the section that follows, those components that affect vocabulary learning most strongly are described: attention, definitions, context, authenticity, extended vocabulary instruction, multiple exposures, spaced learning, depth of processing, and retrieval. Because the purpose of vocabulary learning is presumably subsequent use leading to improved communication, an understanding of the processes that best support the learning of word form, meaning, and use is desirable.

2.3.1 Attention/Noticing

A primary cognitive condition under which vocabulary learning occurs is that of attention, or noticing. This means that learners need to notice a word and identify it as a potentially useful item of information (McLaughlin, 1990; Schmidt, 1990). Hulstijn (2001) illustrated the usefulness of noticing in a study comparing incidental and intentional learning. The findings indicate that drawing attention to new words increases the probability that students will learn them. Noticing may be affected by previous exposure, context, the importance of a word to a text, or an understanding that the word fills a knowledge gap (Nation, 2001). Interest and motivation may also affect learners' attention to words.

McLaughlin et al. (1983) note that it is important that attention be viewed as a continuum and that it is difficult to ascertain precisely how much attention a learner is paying to formal linguistic properties. Along the continuum, native language processing might be at the automatic end (proceduralized), and a beginning second language learner may be at the controlled (declarative) end. For second-language learners, and even for native speakers, vocabulary decisions may require considerable attention (Bock, 1982; Levelt, 1977).

Language learning in the initial stages involves the use of controlled processes with attention focused on the task demands (accessing declarative knowledge). Beginning language

learners may require a substantial amount of cognitive effort and attention simply to find an appropriate word or expression while drawing on limited L2 vocabulary knowledge. The success of the learner in handling language input depends on the characteristics of the input, especially the degree of attention involved in the learning task, and the learner's information processing ability. The more attention required, the more cognitive resources are utilized, and the slower the processing of the information (McLaughlin et al., 1983). As learners become more familiar with the task, demands on attention are decreased, and automatic processes develop (procedural knowledge). The preliminary stages of language learning involve the deliberate development of skills while the learner endeavors to automatize (proceduralize) a variety of elements of the language (McLaughlin et al., 1983). Once learning is proceduralized, information processing is automatic and may include attention to formal properties of the language, such as during a test, or may not involve such attention, such as during a conversation that includes elements of the language already well known to the learner.

2.3.2 Definitions

Some studies indicate that vocabulary learning increases when learners have a brief definition during the reading or hearing of a story due to the focus of attention on the words (Knight, 1994). This finding, however, is not consistently supported by other research (Hulstijn, 1993). If explicit teaching of decontextualized vocabulary, or words that are attended to as words rather than as part of the message, contributes to implicit knowledge of words, then temporarily focusing on word definitions during the telling or reading of a story can aid implicit, incremental learning of vocabulary. Indeed, Stahl and Fairbanks (1986) report that a combination of definitional and contextual information leads to greater reading comprehension and vocabulary learning than definitional methods alone. Direct communication of word meaning can occur during formal vocabulary instruction in the form of incidental definitions during story telling or

reading aloud activities, during deliberate teaching of content during job training or in lectures, or in the form of glosses in academic reading.

The form that definitions themselves take influences vocabulary learning. In a study comparing the effect of definition type on learning, Cumming, Cropp and Sussex (1994) observed that learners favored the sentence definition format and preferred definitions with examples. McKeown (1993) reported that young native speakers focused on the typical underlying meaning of words when definitions were revised to include simpler language and encouraged them to consider the whole definition. They were then able to write sentences using the new word and to explain its meaning. Definitions that were unhelpful to learners were too vague, disjointed, or contained confusing words. Revised definitions that were the most helpful to learners were actually longer than the original dictionary definitions. Essentially, for definitions to be effective, they need to be specific, direct, simple, and unambiguous.

2.3.3 Context

Presenting to-be-learned words in context is preferable to exposure in isolation, such as in paired-associate word presentations. Contexts are better able to reveal the form, meaning, and use of the words needed in order to process them and create links and associations with other words (Nation, 1990; Singleton, 1999, in Nation, 1990). Some research has shown that providing one or several sentence contexts, in addition to a definition, facilitates word learning. Gipe and Arnold (1979) determined that contexts with definitions proved to be superior to synonyms or short definitions, a classification task, or the use of a dictionary. Nist and Olejnik (1995) reported that when learners encountered a word in context followed by a definition, the context boosted performance on a multiple-choice test that required choosing a situation in which the word would apply. This same study also showed, however, that the quality of the dictionary definition had the greatest impact on learning. This suggests that, although a definition may provide the best

information regarding the meaning of a word, the context may provide information about the use of the word.

2.3.4 Authenticity

One of the principles of communicative language teaching is that written and oral texts selected for instructional use should be authentic (Savignon, 1983; 1997). That is, written texts should be written by a native speaker of English for a native English speaking audience. The reason for this belief is multi-faceted: first, an authentic text provides quality material for exposure, or input; second, authentic material provides genuine native-speaking models for learners to emulate; third, exposure to authentic materials may be more motivating to learners than the contrived materials often produced by textbook authors; fourth, the face validity of authentic materials is higher in the eyes of most learners than are manufactured materials; fifth, the vast amount of authentic (written text) materials produced by and for native speakers provides a greater variety of topics and styles, which increases the probability that the interests and needs of second language learners will be met; and finally, with the growing use of the World Wide Web, the current availability of authentic texts (as well as e-mail and synchronous chat) has grown substantially and provides possibilities for interaction with rich and varied authentic texts.

Another benefit of interactions with authentic written texts is that they can provide learners with multiple exposures to vocabulary words, allowing for contact with additional definitional features and different parts of speech rather than just the simplified definitions that most language learners encounter. Interactions with multiple definitions through contact with a variety of texts provide learners with the opportunity to expand their understanding of second-language words. Similarly, encounters with familiar words in a variety of settings allow the honing of understanding and associations with known words.

Access to authentic texts, however, does not necessarily guarantee a pleasant, fruitful learning experience. Texts written by native speakers are not always easily comprehensible even

to other native speakers with shared cultural experiences. Because of changes in rhetorical conventions over time (e.g., organizational structures and gender-related terminology), academic tone (exemplified by word choice and density of ideas), presumptions of knowledge of cultural literary classics, as well as presumptions of prior knowledge on a topic, a given text may not be easy to comprehend (Floyd & Carrell, 1987; Steffensen & Joag-Dev, 1979; Steffensen & Joag-Dev, 1984). Certain rhetorical conventions may be exclusionary and, thereby, require detailed knowledge or extensive experience with rules and patterns of discourse, creating a boundary between in- and out-groups of readers (Floyd & Carrell, 1987; Steffensen & Joag-Dev, 1979; Steffensen & Joag-Dev, 1984). As a result, many second-language learners encountering older, highly academic, or difficult texts may undoubtedly have much difficulty in reading and comprehension.

Although authentic texts are good sources of language, learners may have difficulty comprehending and learning from them. If the goal of the interactions with texts is language learning, it may be beneficial if selected texts are less difficult or adapted to a level of difficulty appropriate for the audience. Other possible ways to make long or difficult authentic texts easier for learners to use are to allow self-paced reading and studying of in-text vocabulary, examinations of assumptions about the meaning of certain words, and returning to earlier sections of the passage to check comprehension.

2.3.5 Extended Vocabulary Instruction

Enhancement of word learning beyond reading definitional glosses can be achieved with the use of extended vocabulary instruction, which is characterized by explicit, language-focused teaching of definitions and contextual information. Some evidence suggests that learners benefit from intentional teaching of language elements and that vocabulary should be directly taught (Ellis, 1990; Long, 1988; Nation, 2001). Certainly, the direct study of certain features of words can help learners identify patterns and strategies to assist in more effective, efficient vocabulary

learning. Extended instruction can also incorporate exercises that encourage deeper-level processing. Although they are not especially rich learning experiences, activities such as matching sentence parts and definitional multiple choice can encourage semantic encoding (Ellis, 1994; Laufer & Hulstijn, 2001).

Extended instruction is beneficial because without more information about a word beyond meaning, activities are not likely to strengthen the network of links between concepts and words and between old and new information that lead to good retention (Hulstijn, 2001). Additionally, the lack of engaging activities that incorporate information about form, meaning, and use will not lead to the transfer of knowledge when words are met in novel contexts (Nagy, 1997). Further, for explicit learning to occur, opportunities for rehearsal of the words through fruitful and varied input are necessary (Ellis, 1994; Hulstijn, 2001; Sokmen, 1997). Extended instruction is favorable because paired-associate learning, which is used by many textbook authors, does not provide enriching instantiations of a word, even if it is met several times; it may strengthen a learner's knowledge, but it does not enrich it (Nation, 2001). Vocabulary learning activities clearly need to engage learners in multiple aspects of knowledge about the words in order for recognition and production, the goals of vocabulary learning, to be attained.

2.3.6 Multiple Exposures

The strength of association between items of information may be affected by the number of exposures to the item. When information is re-encountered over time, the result is multiple exposures, which establish a stronger link to related information (Pressley & McCormick, 1995). Repeated exposures to information (practice, observations, etc.) produce lasting, retrievable knowledge. Each presentation of to-be-learned information, then, encourages attention to different aspects of the item and, thus, encourages learners to hone their understanding of the word's meaning (Anderson, 1990). Multiple presentation may also encourage different ways of

studying the content, which also results in a richer representation of the newly-learned item (Gagne et al., 1993; Pressley & McCormick, 1995; Tulving & Thompson, 1973).

Multiple exposures to words are required for their acquisition because vocabulary learning is an iterative, cumulative, elaborative, and incremental process. The use of a variety of tasks not only provides multiple exposures to the words, but also requires attention to different aspects of lexical features. This combination leads to knowledge of a number of items of information about the word, and if processed sufficiently, results in elaboration, reinforcement, and strengthening of knowledge. It also allows learners to self-correct incorrect inferences they may have made about words during earlier encounters (Paribakht & Wesche, 2000).

To-be-learned words may be encountered multiple times in reading texts with glosses. Because glosses contain the word form as well as a definition, learners are exposed to the word again as they read the gloss, resulting in multiple exposures to the word. Long, cited in Watanabe (1997) suggests that glossing may provide learners with three encounters with the to-be-learned word: in the text itself, in the gloss, and again in the text when the learner returns to the task of reading. In another study of the effects of gloss and frequency of exposure, Hulstijn, Hollander, and Greidanus (1996) examined the effect of within-text word frequency (one or three occasions) on learning. The effect of frequency on learning was significant, especially for the group reading texts with marginal glosses. This group showed learning gains superior to the dictionary, no dictionary, and no gloss groups. Glosses, then, appear to provide learners with multiple exposures to vocabulary words, albeit in a single context.

Nation (2001) discusses a conceptual extension of multiple exposures, that of generative processing, which occurs when previously-encountered words are subsequently met or used in ways that differ from the previous meeting with the word. Generative processing can be either receptive as in reading or hearing the word, or productive, as in writing or speaking the word. Learners have the opportunity to hone their knowledge of the word either by adding or detracting

a small amount of new information, or by re-conceptualizing their understanding of it, which thereby hones and expands a learner's understanding of the word.

Multiple exposures to information benefit the placement of new knowledge nodes, the strengthening of associations, and the number of possible retrieval paths. Gagne et al. (1993) state that, “[M]eaning is inherent in connections between parts of the knowledge structure. Learning of declarative knowledge is synonymous with the creation of meaning. When no meaning (no connections) can be created, little is learned.” (p. 125). Thus, without multiple connections within the knowledge network, neither conceptual nor label knowledge is acquired.

Although it makes use of different terminology, Alexander, Schallert, and Hare’s (1991) concept of instantiation relies on multiple exposures to words. Through instantiation, learners develop a dynamic knowledge network through the interaction between prior knowledge and on-going experience. The more often learners are exposed to, for example, a particular second language word, the greater their understanding of it becomes. In other words, when learners encounter a new second-language word, they develop an understanding of it on the basis of both conceptual and discourse knowledge, in addition to contextual cues. This understanding may be tenuous, but it serves immediate needs. Provided that the learner has expended enough effort to encode the word into LTM by linking it to associated words in the knowledge network, it can be retrieved when needed. When encountering the word later, the learner can discover whether the tentative definition is appropriate in the new context. If it is, the association will be strengthened, and new links may be formed that include aspects of the current contextual information that appears to be relevant. If the definition does not fit as well as expected, relevant and telling information extracted from the new context may be used to re-conceptualize the learner’s understanding of the word. Information may, therefore, be gained or shed in light of the new conceptualization of the word.

The importance of multiple exposures is also illustrated in a study by Elshout-Mohr and van Daalen-Kaptejns (1987). They found that successful vocabulary learners utilized an analytical approach to word learning that involved developing a concept for a word that included several separate components of meaning. This approach makes room for new informational elements and leads to a more effective and efficient construction of a concept. This approach allows learners to understand the new word more effectively when it is met in a new context and to contribute to its meaning through successive meetings with the word.

2.3.7 Spaced Learning

A learning principle related to that of multiple exposures is that of spaced learning. Both rely on various encounters with an item of to-be-learned information; however, they differ in their focus on timing. Spaced learning, or distributed learning, is also an important aspect of vocabulary learning. As with multiple exposures, its virtue is that it increases the number of encounters with a to-be-learned item as well as increasing encoding variability compared to a single or massed presentation. Distributed learning provides opportunities to think differently about the information with each encounter; potentially providing elaborate and distinctive encounters with the words that lead to better storage.

Spaced learning takes place over a period of time, with each successive encounter spaced with increasing gaps between repetitions (Pimsleur, 1967). In other words, the first repetition occurs shortly after the information is introduced. The next repetitions are a day or more away, followed by a week or more. In several learning studies, spaced practice proved superior to massed practice (Gagne, et al., 1993).

Spaced learning may reduce anxiety, one of the main threats to the acquisition of new information. Because this emotional state is demanding of the already limited capacity of working memory, it can hinder or even halt the spread of activation and, thereby, limit retrieval and lower the possibility of linking new information to related prior knowledge. As a result of

distributing exposures to the to-be-learned information over time and across settings or contexts, it is likely that the overall negative effect of anxiety on learning will be reduced and that information will be more successfully encoded and, when needed, retrieved.

2.3.8 Depth of Processing

The depth of processing theory was discussed briefly in its relationship to information processing in the preceding section (2.3) but deserves a more thorough explanation. Its importance lies in its explanation of how and why some new information reaches LTM and is available for retrieval, whereas other information does not. An understanding of this learning principle may allow for better planning and selection of activities and materials that encourage learning.

Craik and Lockhart (1972) described depth of processing as the degree to which new information is processed. As a learner moves from shallow processing of sensory data, such as the features of the sound of a word, to a deeper level of processing, such as the consideration of the semantic aspects of a word, memory traces become more permanent, leading to the greater likelihood of retention. When stimuli are processed more deeply, they are analyzed for meaning and linked to existing information stored in memory.

Craik and Tulving (1975) later expanded the theory to include the effects of depth of processing on retrieval. They suggested that retrieval is improved by the elaboration of information. For sensory information to be elaborated on, additional acoustical or visual information has to be attended to and processed. Semantic elaboration takes place when learners make meaningful responses to tasks or questions. To this end, Benton, Glover, and Bruning (1983) found that an increase in the number of responses to textual questions led to a corresponding increase in recall of the information. In the context of vocabulary learning, any process by which learners act on the meaning of the word, thereby processing it more deeply, should increase the likelihood that the word will later be retrieved when needed.

2.3.9 Retrieval

Retrieval was discussed earlier in the learning components section (2.3); however, revisiting the topic here is useful in order to illustrate its relationship to word learning more clearly. Baddeley (1990) states that retrieval assists word learning. A word may be noticed, processed, and comprehended in the context of an oral or written text. If that word is then retrieved during the task, memory of the word will be strengthened (Nation, 2001). This retrieval may be either receptive or productive. Receptive retrieval includes perceiving the word and retrieving its meaning from memory when the word is encountered in listening or reading. Productive retrieval includes the desire to communicate using the word and having to retrieve the word from memory for use in speaking or writing. However, if the word and its meaning are presented concurrently, retrieval is not necessary (Nation, 2001).

Repetition of newly-learned vocabulary is an important element of incidental vocabulary learning (Elley, 1989). Baddeley (1990) proposes, moreover, that the chance to retrieve items repeatedly may be as important as the repetition of input. This retrieval causes the learner to focus on the elements of the meaning that are stored in long-term memory from previous encounters, as well as on the contextual factors from the present encounter. Each retrieval event strengthens the retrieval path that links the word form and its meaning(s), which makes later retrievals easier (Baddeley, 1990; Gagne et al., 1993; Gredler, 1992). The spacing of encounters and retrieval attempts for newly-learned words should consist of short gaps between early meetings with words and increasingly larger gaps between later meetings (Baddeley, 1990). The number of previous encounters with a word influences the amount of time that the memory of its meaning will remain.

2.3.10 Summary of Conditions Necessary for Vocabulary Learning

The conditions necessary for vocabulary learning are numerous, but each is an important contributor to the incremental process of learning. For information to be processed sufficiently

enough to be stored and retrieved from long term memory, attention, definitions, context, authenticity, extended instruction, multiple exposures, spaced practice, depth of processing, and retrieval are all important factors that determine whether and how effectively and efficiently vocabulary is learned. Given that the presence of these conditions is known to assist learning, and therefore, should be present in exercises designed to enhance vocabulary learning, the discussion now turns to methods of presentation, or delivery, which can effectively incorporate such learning-enhancing conditions.

2.4 Vocabulary Learning Delivery

If the conditions surrounding word knowledge, how learning occurs, and the conditions that support vocabulary learning are better understood, then alternative means of delivering effective and efficient vocabulary instruction and tasks can be developed and honed for greater success. Because the practical constraints on time within classrooms dictate that not all instruction can occur inside the classroom, much learning and practice must take place outside of class. The concerns of teachers, however, are that their students spend their time performing tasks accurately and that they receive timely feedback. To this end, the language learning community has turned to both paper- and software-based materials to provide supplemental instruction and practice. The focus of this section, and of this study, is on the use of multimedia-based learning activities as a means of providing effective vocabulary instruction. Therefore, attention must be paid to design features of the materials, the use of multi-media, and the benefits and constraints of technologically enhanced language learning.

2.4.1 Activity Design Features that Encourage Vocabulary Learning

Several design features may support the conditions necessary for learning vocabulary by encouraging noticing, retrieval, and generation of to-be-learned words (Nation, 2001). Stahl and

Fairbanks (1986) describe a three-point scale for the depth of processing of vocabulary that leads to learning. First, association is described as learning a form-meaning connection, second, comprehension is the recall of the meaning of a previously learned word, and third, generation is the production of a new response, such as restating a definition or creating an original sentence. These levels correspond roughly to Nation's noticing, retrieving, and generating of the form, meaning, and use of words.

Vocabulary learning may occur through a variety of activities, including passive and active interactions with vocabulary before, during, or after reading. The efficient learning of vocabulary requires effort on the part of the learner (Prince, 1996; Sternberg, 1987). To speed vocabulary learning and to build the sizeable vocabulary needed for proficiency in academic English, intentional learning via authentic L2 materials appears to be a reasonable approach (Groot, 2000). To increase both efficiency and effectiveness of vocabulary learning, Paribakht and Wesche (1996), drawing on Gass' (1988) work, developed a typology of text-based vocabulary exercises intended to supplement reading texts which describe five levels of learning from input. This categorization connects vocabulary exercises to the conditions under which learning may occur.

1. Selective attention draws learners' attention to target words and ensures that they are noticed. Task features that encourage selective attention include underlining, bold-facing, or circling the target words. Observable signs that learning is occurring are that the learner consults a glossary, pauses over the word, or negotiates the meaning of the word (Nation, 2001).
2. Recognition requires learners to form an association between the written form of the target word and one or more of its meanings. Task features that encourage recognition include matching words with their definitions, matching words with a

synonym, and recognizing word meaning from multiple-choice options. This may be the first step to receptive retrieval.

3. Manipulation requires a structural/morphological analysis of target words to rearrange or organize the word parts. Task features that encourage manipulation include changing the grammatical category of a word and constructing words using stems and affixes.
4. Interpretation involves semantic and syntactic analysis, including the relationship of target words with other words in a context. Task features that encourage interpretation include guessing word meaning from context and multiple-choice cloze exercises.
5. Production requires the retrieval and production of target words in appropriate, novel contexts. Task features that encourage production include open cloze exercises and answering questions requiring the target word. Observable signs that learning is occurring are that the learners produce new words in new sentence contexts, or the learners produce associations or causal links.

Additionally, the use of vocabulary exercises based on these five categories ensures that learners not only have multiple exposures to the words, but that the exposures are meaningful. If learners do not understand the meaning of a word from the context or from one exercise, they have another opportunity to understand it when they encounter it again in a subsequent exercise. Unlike reading for comprehension exercises, the vocabulary learning tasks ensure that learners not only gain repeated and meaningful exposure to the words, but also require learner interaction with different aspects of the words' meaning(s) and uses (Paribakht & Wesche, 2000).

The potential effectiveness of vocabulary exercises may also be analyzed by determining whether they meet the criteria of having an identifiable learning goal, support cognitive or other

psychological conditions that assist learning, contain design features that support conditions for learning, and contain observable evidence that learning has occurred (Stahl & Fairbanks, 1986).

2.4.2 The Role of Multimedia Technology in Vocabulary Learning

Whether vocabulary is learned in classrooms or through personal reading, learners need access to vocabulary-rich materials. To enhance L2 instruction, a branch of complementary second language acquisition research has been steadily growing (Chapelle, 1998). With the adoption of humanistic and cognitive principles in place of a behavioral approach to learning, the use of computers has been greatly expanded because a much greater range of learning activities is now possible (Davies & Higgins, 1985). In the past few decades, the use of computers in the enhancement of language learning has taken on a different role than they occupied in previous years (Hoven, 1999). Researchers and teachers have attempted to use computer-assisted language learning (CALL) to provide instruction and support for language learners both in and outside of the classroom for the purpose of increasing learners' access to the second language.

In a computer-assisted language learning (CALL) environment, learners can take control over their own learning at any stage of their development when exposed to activities that increase awareness of the language (Hoven, 1999). This can be achieved by designing CALL software that incorporates different modes of interaction based on varying levels of learner control at different stages of learner scaffolding needs. CALL software may be designed to enhance learners' input and increase intake, leading to a subsequent growth in proficiency. CALL technology has already facilitated reading comprehension through the use of sound, pictures, animation, video, and, of course, text.

Many of the same features that enhance reading comprehension have also been shown to play an important role in vocabulary learning and are ideal components of language learning instructional materials (Chun & Plass, 1997). CALL software may be especially suited to help with vocabulary learning because of its ability to include unobtrusive, within-text, multi-media

glosses which may prove to be more useful than dictionaries and even marginal glosses because they are easily accessible, need only be accessed if a word is unfamiliar, and convenient and easy to use. Computer software and the World Wide Web can enable learners to encounter or even interact with authentic language learning materials while providing them with the support they need as they learn new vocabulary. Software can incorporate features and exercises that encourage noticing, retrieval, and generation of new words in a variety of contexts and exercises, thus encouraging multiple exposures, depth of processing, and the opportunity to hone understanding of the concepts being represented and of the labels attached to them. CALL software may be designed to include within-text features such as glosses, exercises, comprehension questions, and quizzes, as well as tracking features that provide text interaction and time-on-task information for teachers and researchers. It is also possible to design feedback features into software to allow learners to assess their own progress. This feature may be especially important for those learning independently due to a lack of suitable or available classes or for those who wish to supplement their coursework.

CALL technology has several potential benefits for language learners because of software versatility and growing availability. The use of CALL should be expected to remain true to its name, computer *assisted* language learning, which may be especially effective for those who have little access to the second language and should not be expected to be a suitable substitute for the human interaction necessary for language learning. However, CALL can certainly be of benefit to those with little access to the second language outside of the classroom.

2.4.3 Summary of Vocabulary Learning Delivery

The ways in which vocabulary instruction or exercises may be delivered are varied, but the benefits of technological modes of delivery are that they offer the ability to provide multiple encounters with words in a variety of modalities, thus encouraging attention, recognition, manipulation, interpretation, and production of the form, meaning, and use of newly-learned

words, leading to improved knowledge and language proficiency. Because learning does not occur only in classrooms but also beyond them, the development of materials and technology to supplement learning in ways that are convenient and effective can only benefit language learners.

2.5 Conclusion of Review of Relevant Literature

Because the purpose of language learning is to communicate, which cannot be done well or without frustration without a sufficient vocabulary, vocabulary learning is essential to advanced communication. It is important to understand how this study conceptualizes how humans learn vocabulary so that the creation of materials to enhance vocabulary learning can be further developed. Fraser (1999) suggests that reading-based approaches to vocabulary acquisition may be combined with explicit instruction to build a sufficient knowledge of words to allow for text comprehension. Explicit instruction also contains within it the idea of multiple exposures and varied contexts, both of which are promoted as effective at enriching learning. This combination of approaches may enhance the effectiveness of vocabulary learning, retention, and production.

Technologically-assisted language learning has the potential to contribute greatly to second language acquisition research and instruction because it may be used to gloss words unobtrusively, and encourage interaction with words in authentic, interesting texts and exercises that provide comprehensible input. CALL environments also offer the possibility of situating cognition (providing vocabulary within context) that makes learning more meaningful, encourages deeper processing, and increases the probability of subsequent recognition, recall, and production. Finally, computerized exercises serve learners' needs for rehearsal without consuming limited and valuable class time. All of these are important reasons for the continued

study of CALL's benefits and potential for inclusion in classroom or individual learning environments.

2.6 The Present Study

To address the author's questions about the importance of vocabulary to second language learning that guided this study, the researcher developed an experimental glossed (Hulstijn, 1993; Hulstijn, Hollander, & Greidanus, 1996; Jacobs, Dufon, & Hong, 1994; Knight, 1994; Laufer & Shumueli, 1997; Mondria & Wit de Boer, 1991; Paribakht & Wesche, 1996, 1997; Watanabe, 1997) reading-based, text approach plus explicit instruction (Fraser, 1999; Paribakht and Wesche, 1993) in the shape of vocabulary exercises focusing on form, meaning, and use (Nation, 2001). The text and exercises used in the present study were based on and developed according to what has been learned from the literature: the elements that comprise word knowledge, an understanding of the mechanisms of human learning, and the incorporation of as many specific vocabulary learning elements that honor those mechanisms as it was feasible to include in the text and exercises, all delivered via technology that may be used either in or out of a classroom, and thus serve as a supplement to classroom instruction while sparing valuable class time. This line of inquiry led to the following research questions and hypotheses:

Does the glossed text plus exercises treatment improve vocabulary learning?

1. Participants in the experimental group will score higher on both the immediate and delayed vocabulary posttests than participants in the control group will.
2. Participants in the experimental group will score higher on both the immediate and delayed vocabulary posttests than participants in the control group will after controlling for prior knowledge.

3. Participants in the experimental group will score higher on immediate and delayed posttest recognition items than participants in the control group will.
4. Participants in the experimental group will score higher on immediate and delayed posttest recall items than participants in the control group will.
5. Participants in the experimental group will score higher on immediate and delayed vocabulary tests than participants in the control groups will, regardless of IEP class level.

Do relationships exist between gloss activation, prior knowledge, motivation, and performance?

6. Significant correlations will exist between activating a gloss, performance, and prior knowledge.
7. Motivation, as measured on the feedback form, will correlate positively to performance.

Are there differences in posttest performance between participants with differing educational level, IEP level, and L1?

8. Participants with higher levels of education will outperform participants with lower levels of education on immediate and delayed vocabulary posttests.
9. Higher IEP level participants will outperform lower IEP level participants on both the immediate and delayed vocabulary posttests.
10. No differences will exist in performance on immediate and delayed vocabulary posttests between L1 groups.

Do ratings of treatment helpfulness differ between groups?

11. Participants in the experimental group will rate the helpfulness of the exercises in contributing to learning higher than participants in the control group will.

If the combination of reading a glossed text plus interacting with exercises designed for explicit vocabulary learning can contribute positively to word learning, then this protocol may be applied to other to-be-learned vocabulary valuable to learners, thus increasing the speed with

which learners gain passive and active vocabulary proficiency and lead to increases in overall language proficiency and advanced communication.

Chapter 3

Methods

3.1 Introduction

The aim of this study was to determine whether an instructional design comprised of a reading with in-text vocabulary glosses combined with exercises that provide interaction with to-be-learned vocabulary focusing on the form, meaning, and use of the words would lead to improved performance on immediate and delayed vocabulary posttests. The post-test only, control group experimental design of this study grew from information processing theory which explains the progression of information from sensory-, to short-term, to long-term memory; the conditions needed to learn vocabulary that arise from that processing of information; activity design features; and the use of CALL technology as an effective method of instructional delivery. The independent variables were the two treatments; the dependent variables were performance on the vocabulary posttests and responses to a feedback questionnaire. Performance on both the immediate and the delayed vocabulary posttests were scored. The data were analyzed using SPSS statistical software and interpreted to determine whether vocabulary may be learned more effectively through interaction with text-embedded glosses plus exercises than through dictionary use plus writing tasks. Finally, responses to the Likert-scale questions regarding participants' impressions of the text and tasks were analyzed and will be considered when modifying the software program for use in classroom settings. Each of the materials and procedures is described in greater detail below.

3.2 Participants

Sixty international students enrolled in an intensive English program (IEP) at a large mid-Atlantic state university participated in this study as part of their reading course work. To avoid unintentional coercion in the recruitment of participants, those who declined participation were given the opportunity to perform a separate task, comparable in difficulty and time required for completion. Fifty-six participants completed the study; to avoid including incomplete data in the statistical analysis and threatening the internal validity of the study (mortality), the data from the four participants who were absent for one or more of the data collection sessions were discarded (Borg & Gall, 1989). Participants were from a variety of national and language backgrounds and reflect the IEP student population of the university. They were enrolled in levels 2, 3, or 4 (out of 4) of the IEP's classes. Their ages ranged from 18 to 45 years. Though the study participants represented several language backgrounds, which could complicate data analysis, a homogeneous group was not selected in order to provide a more realistic representation of English language learners.

The table in appendix A summarizes participant background data, showing the variable and the frequency of occurrence.

3.3 Materials

The materials used in this study consisted of a background questionnaire (identical for both the control and experimental groups), a written text (identical for both the control and experimental groups) in online and hard copy versions, respectively, software used to gloss vocabulary words and collect data (for the experimental group only), vocabulary exercises (for the experimental group only), a writing task (for the control group only) and a vocabulary posttest

(identical for both the control and experimental groups) which was used for both the immediate and delayed posttests. Finally, a feedback questionnaire was also administered to participants. Each is described in the sections that follow. Additionally, for ease of comparison, a table describing each step of the data collection process for each of the two groups is included below.

3.3.1 Background Questionnaire

Participants were asked to complete a background questionnaire gathering information on their class level at the IEP, age, sex, country of origin, first language (L1), number of years spent studying English, length of time spent in the United States, length of time spent in other English-speaking countries, and level of education. This information was collected in order to control for variables which were not of central importance or interest to the present experiment but which might have influenced the outcome (Borg & Gall, 1989). Cases in which the outcome was affected will be noted in the results and discussion sections.

3.3.2 Text Design

The text used in the current study as the stimulus for both the control and experimental groups was a modified, authentic, two-and-a-half-page text on the topic of an early literacy experience written by the researcher for a graduate course unrelated to the current project. An authentic text was selected because it was written by a native speaker for native-speakers and adapted to the audience (Groot, 2000; Savignon, 1983; 1997) in order to arouse a sufficient level of interest in participants to facilitate full participation in and completion of the research tasks. The text is not offensive to any group of participants, nor does it assume that participants possess specific cultural knowledge about the United States.

To confirm the appropriateness of the text and of the level of text difficulty, the researcher consulted the participants' reading instructors for confirmation that the level of difficulty was appropriate for the target audience in terms of content, text length, vocabulary

familiarity, and syntactic complexity. These elements are described in further detail in the corresponding sections below.

The stimulus text for the control group was paper-based. Each participant in the groups was given an individual copy to read. The to-be-learned words were printed in bold type to direct participant attention to the words. The text remained with the participants throughout the session until the posttest was administered.

The stimulus text for the experimental group was placed on-line, and contained unobtrusive, hypertext glosses containing a brief definition and an example sentence which could be activated by moving the computer's mouse over the to-be-learned vocabulary words.

3.3.3 Text Length

The length of the stimulus text is two and a half pages and contains 752 words -- comparable to Chun and Plass' text length of 762 words in a vocabulary acquisition gloss study (1996). The stimulus text includes 8 paragraphs, 41 sentences, and 47 lines. The length was deemed appropriate for use in this study because learners in levels 2, 3, and 4 in the IEP program are not trained to read long passages. In addition, since participants were asked to perform other tasks after reading the text, the researcher chose not to provide a long reading task in order to avoid participant fatigue.

3.3.4 Level of Difficulty

The level of difficulty of the original text was modified for use in the present study to be more appropriate for the target group of participants in terms of semantic complexity (Groot, 2000; Savignon, 1983; 1997). The text contains 20 glossed vocabulary words, which constitute 3% of the entire text. This proportion of unknown words is in line with Swanborn and de Glopper's (1999) finding that texts containing more than 3% of unknown words impaired comprehension and is below Laufer's recommendation that no more than 5% of a text's vocabulary should be unknown (in Nation, 2001).

In addition to semantic complexity, the text was also analyzed for syntactic complexity. The IEP instructors stated that the original text was more complex than their students were accustomed to. The researcher modified the text, reducing the number of complex and compound-complex sentences to increase text comprehensibility. The modified text contains 22 simple sentences (54 %), 4 compound sentences (10 %), 11 complex sentences (26 %), and 4 compound-complex sentences (10 %). The IEP instructors were asked to read the modified text and determine whether they found it suitable for their students. They determined that the proportion of simple sentences to other sentence types made the story appropriate for the participants (personal communication, Henning, 2001).

To determine suitability from a participant point of view, the level of difficulty of the text was determined by administering the text to six IEP students who did not participate in the study. Two students from each of the three levels included in this study were asked to read the text for comprehension, rate the comprehensibility of the text on a scale from five (easy to understand) to one (impossible to understand), and orally explain their understanding of the text to the researcher. All participants rated the text between five and three with a mean rating of 3.67 (5 = 1, 4 = 2, 3 = 3). Since this number corresponded to a mean rating of medium difficulty, the text was deemed appropriate for all participants.

3.3.5 Selection of Target Vocabulary Words

Selection criteria for the to-be-learned vocabulary were based on exclusion from the General Services Word List (West, 1953), which contains 2,000 headwords representing the most frequently used English words and word families and were likely to be known to the participants. Only words that do not appear on the list were chosen as the vocabulary stimuli for this study. In the experimental condition's hypertext glosses, when words had multiple meanings, the gloss provided the definition most relevant to the context in which the word was used.

To further ensure that the to-be-learned vocabulary words were not likely to be known by the participants, the researcher asked the IEP instructors to identify any vocabulary words in the text that had been taught or encountered frequently during the course of instruction/learning. Any words identified by the instructors as likely to be known to the participants were then disqualified as potential target vocabulary words. As an additional confirmation of the appropriateness of the vocabulary glosses selected for use in the study, three additional IEP students who were not enrolled in the study were consulted regarding familiarity with the target vocabulary words by indicating all unfamiliar vocabulary words. After consulting the General Services Word list, IEP instructors, and three IEP non-participant students, the vocabulary words selected as target words were 10 nouns (50%), 8 verbs (40%), and 2 adjectives (10%).

The selected words were printed in bold lettering within the text to encourage noticing of the vocabulary words (Gass, 1988; Paribakht & Wesche, 1996). The to-be-learned words were not glossed in the control condition, but the participants were instructed to look up any unfamiliar words encountered in the text, encouraging action on the part of the participants to learn the targeted vocabulary words. In the experimental condition, in addition to presenting the to-be-learned words in bold lettering, they were also glossed unobtrusively to avoid any interruptions to the reading process while allowing participants the choice of obtaining definitions during reading (Davis, 1989; Davis & Lyman-Hager, 1997; Hulstijn, 1993; Knight, 1994). The gloss forms of definition plus example sentences were selected based on Gettys, et al.'s (2001) finding that dictionary glosses were more effective than sentence-level translations. The glosses could only be activated through participant action of moving the mouse over the glossed words indicated by bold lettering. As with the control group, this method of glossing was selected to encourage action on the part of the participants to learn the targeted vocabulary words.

3.3.6 Exercises: Control Group

The control group was presented with tasks that are often used effectively in reading courses to boost both comprehension and vocabulary learning. The control group was directed to read the stimulus text and look up any words they did not know. This protocol has been shown to be more effective than non-dictionary conditions on both immediate and delayed posttests (Knight, 1994) and more effective than gloss conditions when participants actually do look up the to-be-learned words (Gettys et al., 2001; Hulstijn et al., 1996). To encourage look-up behaviors, the targeted vocabulary words were printed in bold type in order to direct attention to them. After completion of the text, participants were directed to write about a literacy experience of their own, thus experiencing the opportunity to produce the target vocabulary words meaningfully and advance their vocabulary knowledge (Nation, 2001). Additionally, to ensure an equivalent amount of time on task for both the control and experimental groups, the control-group writing task was designed to require an equivalent amount of time to complete as the exercises performed by the experimental group.

3.3.7 Exercises: Experimental Group

The experimental group was presented with an on-line version of the same text used by the control group. The protocol differed in that the experimental group was directed to move the computer's mouse over any unfamiliar words printed in bold to view a definition appropriate to the context and an example sentence containing the target word. After reading of the text was completed, the software directed participants to a set of vocabulary-learning exercises. The combination reading plus exercises protocol was selected because of its beneficial use in explicit vocabulary learning, even outperforming a repeated exposure condition (Paribakht & Wesche, 1993). This protocol was also selected for the practical reason that vocabulary learning may lead to better comprehension (Fraser, 1999).

The exercises included in the reading plus exercises experimental condition were developed by the researcher and based on Nation's (2001) dimensional taxonomy of word

knowledge and and Paribakht & Wesche's (1996) typology of text-based exercises which include the form, meaning, and use elements of vocabulary knowledge. This was done to encourage participant learning of a broader array of vocabulary knowledge than is typically learned from the more commonly used vocabulary learning practices utilizing paired-associate word lists or dictionary use plus production exercises.

The exercises were developed to meet as many of the conditions necessary for vocabulary learning discussed in detail in chapter two as was possible in a single intervention. The form exercises were intended to encourage attention, the first step in information processing, and thus, learning. Definitions helped to provide a form-link connection. Participants encountered the vocabulary words within the context of the authentic stimulus text prior to interactions with them during the exercises. The exercises themselves provided extended vocabulary instruction, a direct form of teaching focused on the features of the language rather than on comprehension as a whole. Because the words were encountered repeatedly throughout the exercises, participants were exposed to them multiple times and received a limited amount of spaced practice. This distributed learning was limited to the time spent on the exercise tasks. Some of the exercises, such as matching sentence halves, required a depth of processing that should be sufficient to move information from short term to long term memory.

Finally, the immediate and delayed vocabulary posttests provided participants with the opportunity to retrieve the words from memory, which has been shown to be an element not only of testing, but also of learning.

The research-based reasons for the design and inclusion of each of the experimental group's exercise types included in the present research are summarized in the following figure.

Figure 3-1

Exercise	Basis for Form, Meaning, and Use Exercises
Form: Sound (Pronunciation)	Repeated meetings involving noticing and retrieval lead to learning (Baddeley, 1990; Nation, 2001)
Form: Spelling	Repeated meetings involving noticing and retrieval lead to learning (Baddeley, 1990; Nation, 2001)
Form: Parts of Speech	Intake is improved by manipulation of morphological word components (Gass, 1988; Paribakht & Wesche, 1996)
Meaning: Definition	Vocabulary learning increases when words are accompanied by a brief definition (Hulstijn, 1993; Knight, 1994; Stahl & Fairbanks, 1986)
Meaning: Sample Sentences	Learners preferred sentence definition format with examples (Cumming, Cropp, & Sussex, 1994)
Meaning: Matching Word with Definition	Matching encourages semantic encoding (Craik & Lockhart, 1972; Craik & Tulving, 1975; Ellis, 1994; Gass, 1988; Laufer & Hulstijn, 2001; Paribakht & Wesche, 1996)
Meaning: Associations (Synonyms)	Elaboration of information integrates it with background knowledge (Craik & Lockhart, 1972; Craik & Tulving, 1975)
Use: Matching Sentence Halves	Encoding is enhanced by processing information and integrating it with other information (Craik & Lockhart, 1972; Craik & Tulving, 1975; Ellis, 1994; Laufer & Hulstijn, 2001)
Use: Collocations	Matching words with collocations encourages the interpretation of the meaning of words (Gass, 1988; Paribakht & Wesche, 1996)

Figure 3-1 Materials: Experimental Group Exercises

3.3.8 Software – Experimental Group

Software was used in this study to facilitate data collection for the experimental group and to ascertain whether the online features of the software were beneficial to learning. The software was based on the researcher-designed text and its glosses, exercises, and post-test. The researcher designed the software, and a second party executed the html code. The software was internet-based for ease of use and data collection. The software was designed using html code because it provides for relatively simple integration of textual glosses and is suitable for both PC and Mac platforms. The use of html code as the programming language allowed for the unobtrusive glossing of the words and easy activation of the glosses by participants. The software was designed to include features that highlight glossed words and, when activated by participants, provide access to an English textual definition as well as a sample sentence. Research has determined that multimodal glosses, based on Paivio's Dual-Coding theory (1971,

1986) are more effective than textual glosses alone (Chun & Plass, 1996; Plass et al., 1998). Although multimodal glosses used in conjunction with textual glosses appear to add to the effectiveness of treatment conditions, they were excluded from the present software because of the difficulty in obtaining adequate visual glosses for different parts of speech and the inability of the software to consistently provide audio glosses when activated.

In addition to definitions, the text software hosted the researcher-designed exercises based on Nation's (2001) dimensional taxonomy of word knowledge and Paribakht & Wesche's (1996) typology of text based exercises. The tasks contained a variety of form, meaning, and use exercises including matching, fill-in-the-blank, multiple-choice, and table exercises.

Finally, the software also contained an unobtrusive data collection feature that tracked and stored information about whether glosses were activated. This information was used in the statistical analysis of the data.

3.3.9 Vocabulary Posttests

A paper-based version of the vocabulary posttest was developed for participants in the control group, and an on-line version of the posttest was created for the experimental group. The test questions were identical for both groups. Participants in both the experimental and control groups were post-tested twice – immediately after completing the exercises and again after one week.

Immediate posttests measure the amount of learning that occurs as a result of the treatment (Borg & Gall, 1989); whereas delayed posttests are administered to examine long-term retention rates (Groot, 2000; Ulanoff & Pucci, 1999). Long-term retention was tested because of the real-life need for vocabulary recognition and recall long after encoding. Forgetting, or retrieval difficulties, depends on interference: the amount, complexity, and type of information competing for processing during retention (Anderson & Neely, 1996; Bjork, 1992). Testing for

delayed recognition and recall, then, is necessary to determine whether practical learning that may lead to enhanced comprehension has occurred.

The complete posttest contained the twenty target words that were glossed and embedded in the text. In order to control for prior knowledge of the target vocabulary words, participants were asked to indicate whether they had prior knowledge of each of the target vocabulary words by checking a box next to each to-be-learned word. Participants were tested in two ways: for recognition and for recall. Half of the words were tested for recognition and the other half were tested for recall in order to determine whether interaction with the glosses and exercises had differential effects on the two different forms of knowledge – recognition (receptive/passive) and recall (productive/active) which indicate differential depths of knowledge (Craik & Tulving, 1975; Gass, 1998; Nation, 2001; Paribakht & Wesche, 1996, 1997, 2000; Pressley & McCormick, 1995; Stahl & Fairbanks, 1986).

Recognizing a word is easier than producing it; even with partial knowledge, a test taker may be able to make the correct choice (Baddeley, 1990; Corson, 1983, in Nation, 1990; Nation, 1990, Nation, 2001). Recognition test items required participants to choose one of four multiple-choice options. The recognition test items consisted of a repetition of the text with synonyms in place of the original vocabulary words. The multiple choice options consisted of three distracters and the correct response. All choices belonged to the same part-of-speech group in order to more accurately test participants' knowledge of the words rather than their ability to eliminate distracters based on part of speech (Nation, 1990; 2001).

In contrast to recognition, retrieval of a word from the mental lexicon in LTM for production requires that the word be strongly connected to other related words and concepts, thus requiring a greater depth of processing (Groot, 2000). In other words, productive vocabulary requires greater effort than receptive vocabulary does and is 50-100% more difficult than recognizing items (Baddeley, 1990; Corson, 1983, in Nation, 1990; Nation, 1990). In order to

examine whether the experimental treatment would positively affect recall, the other half of the words were tested for recall by requiring participants to write the vocabulary word that corresponded to the definition provided. The recall items consisted of a synonym replacing the original target vocabulary word in the text and a blank on which participants were asked to write the correct target word.

3.3.10 Immediate and Delayed Vocabulary Posttest Differences

A paper-based version of the vocabulary posttest was administered to participants in both the experimental and control groups approximately one week after the immediate posttests were administered. The delayed vocabulary posttest was identical to the immediate vocabulary test except that the delayed posttest did not ask the participants to indicate prior knowledge of the words; that information had previously been collected on the immediate version of the test.

3.3.11 Feedback Questionnaire

A 5-point Likert-format questionnaire was designed to gather feedback from the research participants. The questionnaire required participants to rate statements regarding the usefulness of the text and the tasks. Information gathered by means of this form was used to help determine the limitations of the study and possible improvements in the software or procedures that are needed before it may be developed for classroom use.

Figure 3-2

Conditions	Control Group Tasks	Experimental Group Tasks
Attention/Noticing	Bold words in stimulus text	Bold words in stimulus text - glossed Form: sound exercises Form: spelling exercises Form: parts of speech exercises
Definitions	Dictionary use – optional	Meaning: definition exercises
Context	Reading stimulus text	Reading stimulus text Meaning: sample sentences exercise
Authenticity	Reading stimulus text	Reading stimulus text
Extended Vocabulary Instruction		All form, meaning, and use exercises
Multiple Exposures	Text + Posttests	Text + Potential glosses + 8-9 exercises + Posttests
Spaced Learning	Text Posttests	Text All form, meaning, and use exercises Posttests
Depth of Processing	Possible production of words in essay	Meaning: matching words/definitions exercises Meaning: associations exercises Use: matching sentence halves exercises Use: collocations exercises
Retrieval	Immediate and delayed posttests	Meaning: matching words/definitions exercises Immediate and delayed posttests

Figure 3-2: Comparison of Necessary Conditions for Learning Met by Group

3.4 Procedure

Although methods and procedures were held constant for both the control and experimental groups whenever possible, due to the nature of the study, some differences were inevitable. Below is a discussion of the procedures used over the three data collection sessions for the present study.

3.4.1 Session One

In session one of the data collection, the researcher met with all participating IEP reading classes to recruit participants. Participants were provided with informed consent forms and a limited description of the study. To avoid coercion, any IEP students who did not wish to participate in the study were offered an alternative task that was equivalent to the research tasks in time and effort required for completion (Borg & Gall, 1989). A background questionnaire was then administered to participants for completion. Participants in each IEP level were then assigned randomly either to the experimental or the control group in order to avoid systematic bias in group composition, which would have been a threat to internal validity (Borg & Gall, 1989).

3.4.2 Session Two

Approximately one week after the recruitment sessions which included the administration of background questionnaires, participants met for the second data collection session. To decrease the number of times regular classes were disrupted, approximately half of the participants remained in the classroom where the control group data collection sessions were administered by classroom instructors, and the other half of the participants moved to the IEP's computer lab with the researcher where the experimental group data collection sessions were administered. Written protocols (Appendix 3) were used by the classroom instructors and the researcher to ensure that each administrator provided consistent instructions and avoided special attention or bias.

Control Group

To ensure consistency across participant groups, instructors followed a researcher-produced, written protocol for the administration of the instructions, text, task, and posttest for each control group data-collection session. Participants in the control groups were instructed to read the paper-based text and to use their dictionaries to look up unknown words. The words that were highlighted and glossed in the experimental condition were highlighted in the control

group's paper-based text in order to draw the same amount of attention to the words. Because the present research intended to investigate intentional vocabulary learning, participants were informed that there would be a vocabulary test at the conclusion of the task. Upon completion of the reading task, participants were directed to write an essay on a topic related to the text they had read.

Experimental Group

To ensure consistency across experimental group sessions, the researcher followed a written protocol (Appendix 2) for the administration of the text, tasks, and posttest for each experimental group data-collection session. Participants in the experimental group were presented with a practice session with a text and vocabulary words not used in the study to familiarize themselves with the operation of the online software. Participants were then presented with the real online text and directed to read for understanding. As with the control group, because the present research intended to investigate intentional vocabulary learning, participants were informed of the vocabulary test at the conclusion of the task. Participants in the experimental group were instructed to activate the glosses of unfamiliar words and to complete a series of exercises. The tracking feature embedded in the software recorded the glosses activated by each participant.

Both Groups

When participants finished reading the text and the subsequent tasks, both groups were instructed on how to take the vocabulary test. The posttests for the two treatment groups were identical except that the control group received a paper-based test, and the experimental group received an online form of the test. Instructions included a statement that participants were to place a check in the box next to any vocabulary word that they already knew prior to participation in the study so that positive responses could be statistically partialled out during the analysis to

avoid falsely inflating the posttest scores and subsequent interpretation of the results. The vocabulary posttest was then administered and collected upon completion.

3.4.3 Session Three

Approximately one week after session two, the researcher administered an in-class, paper-based, delayed vocabulary posttest to members of both the control and experimental groups to determine the participants' levels of long-term vocabulary recognition and recall and to ascertain whether the treatment conditions differed over time. The delayed vocabulary posttest was identical to the immediate vocabulary posttest with the exception that participants were not required to place a check next to words of which they had prior knowledge.

Next, participants were asked to record responses to a series of Likert-scale questions about their experiences with the research tasks in order to determine their impressions of the effectiveness of the treatment they received.

Finally, in order to adhere to The Pennsylvania State University's Office of Research Protections guidelines, at the conclusion of the data collection session, participants were provided with a full disclosure statement explaining the purposes of the research.

To clarify the similarities and differences in the research protocols used for the control and experimental groups, please see the following table for comparisons.

Figure 3-3

Session	Control Group	Experimental Group
1	<ol style="list-style-type: none"> 1. Informed consent forms administered 2. Limited description of study given 3. Background questionnaire administered 4. Researcher assigned participants to groups 	<ol style="list-style-type: none"> 1. Informed consent forms administered 2. Limited description of study given 3. Background questionnaire administered 4. Researcher assigned participants to groups
2 Within one week of session 1	<ol style="list-style-type: none"> 1. Participants directed to read text for understanding 2. Informed of vocabulary posttest 3. Participants directed to look up unknown words in a dictionary then write an essay on a related topic 4. Took immediate paper/pencil vocabulary posttest 	<ol style="list-style-type: none"> 1. Participants directed to read text for understanding 2. Informed of vocabulary posttest 3. Participants directed to activate online, in-text glosses and complete vocabulary exercises 4. Took immediate online vocabulary posttest
3 One week after session 2	<ol style="list-style-type: none"> 1. Participants took delayed, paper-based vocabulary posttest 2. Participants recorded responses to Likert-scale and open-ended questions regarding the learning tasks 3. Participants provided with full disclosure statement 	<ol style="list-style-type: none"> 1. Participants took delayed, paper-based vocabulary posttest 2. Participants recorded responses to Likert-scale and open-ended questions regarding the learning tasks 3. Participants provided with full disclosure statement

Figure 3-3: Control and Experimental Group Protocols

3.5 Analysis

In order to minimize threats to internal validity, equal numbers of participants were randomly assigned to either the experimental or the control group. The independent variables were the treatments and IEP levels, and the dependent variables were performance on the vocabulary posttests and responses to the feedback questionnaire. The data were analyzed using

SPSS statistical software (version 16) and interpreted to determine whether vocabulary may be learned more effectively through interaction with text-embedded glosses plus exercises than through dictionary use plus writing tasks. To that end, performances on both the immediate vocabulary posttest and the delayed vocabulary posttest were scored. Because no pretest was used to eliminate initial differences between the experimental and control groups, participants were asked to indicate their prior knowledge of words during the immediate post test to allow the researcher to control for any prior knowledge while looking for differences between groups on posttest performance. Feedback questionnaire data were also analyzed to determine participant impressions of their vocabulary learning experiences.

To elucidate which statistical procedures were used to analyze the data, hypotheses and the analyses performed are included in the following table.

Figure 3-4

	Hypothesis	Statistical Analysis
Learning Outcomes: Text + Exercise Effectiveness	Hypothesis One: Participants in the experimental group will score higher on immediate and delayed vocabulary posttests than participants in the control group will.	t-test
	Hypothesis Two: Participants in the experimental group will score higher on immediate and delayed vocabulary posttests than participants in the control group will after controlling for prior knowledge.	ANCOVA
	Hypothesis Three: Participants in the experimental group will score higher on immediate and delayed recognition items than participants in the control group will.	t-test
	Hypothesis Four: Participants in the experimental group will score higher on immediate and delayed recall items than participants in the control group will.	t-test
	Hypothesis Five: Participants in the experimental group will score higher on immediate and delayed vocabulary tests than participants in the control groups will, regardless of IEP class level.	Two-way ANOVA
Learning Outcomes: Effects of Prior Knowledge	Hypothesis Six: Significant correlations will exist between activating a gloss, performance, and prior knowledge.	Pearson product-moment correlation
Treatment Outcomes: Motivation	Hypothesis Seven: Motivation, as measured on the feedback form, will correlate positively to performance.	Pearson product-moment correlation
Individual Variable Outcomes: Education, IEP, and L1	Hypothesis Eight: Participants with higher levels of education will outperform participants with lower levels of education on immediate and delayed vocabulary posttests.	Pearson product-moment correlation
	Hypothesis Nine: Higher IEP level participants will outperform lower IEP level participants on immediate and delayed vocabulary posttests.	Pearson product-moment correlation
	Hypothesis Ten: No differences will exist in performance on immediate and delayed vocabulary posttests between L1 groups.	One-way ANOVA Scheffé post hoc
Feedback Outcomes: Helpfulness	Hypothesis Eleven: Participants in the experimental group will rate the helpfulness of the exercises in contributing to learning higher than participants in the control group will.	t-test

Figure 3-4: Hypotheses and Analyses

3.5.1 Between-Group Comparisons

As in other research utilizing the posttest-only control-group design (Borg & Gall, 1989), a t-test comparison of the independent mean posttest scores of the experimental and control groups was used to analyze the data. Following general practice in educational research, the .05 significance level was used to reject the null hypothesis, resulting in a 5 in 100 chance that a Type I error, or the rejection of the null hypothesis when it is correct, could occur. Another measure taken to ensure that Type I error was reduced was to predict the direction of the group differences prior to data collection (Borg & Gall, 1989).

A one-way ANCOVA test was used to control for prior knowledge while testing for mean differences between groups on the vocabulary posttests. The covariate of prior knowledge was not of primary interest, but its examination helps explain more of the response, thus reducing the error variance.

Two-way ANOVA tests were performed to analyze the effect of the two independent variables, treatment group and IEP levels, on posttest performance.

A one-way ANOVA test was used to compare participant test performance based on first language. Scheffé post-hoc tests were used to as a measure of all possible combinations of the means to look for differences between all language groups. It is a conservative test used to compensate for false significant results that can occur during multiple comparisons. This analysis was done to determine whether the experimental treatment appeared to be more beneficial for certain language groups than for others.

3.5.2 Correlations

To test the relationships between activation of glosses, prior knowledge of a word, and performance on the vocabulary posttest, a Pearson product-moment correlation was used to determine the degree of the relationships.

Responses to items on the questionnaire were analyzed using Pearson product-moment correlations to determine the degree of relationships between the feedback responses, group membership, level of education, IEP level, and performance on the posttests. Responses to the Likert-scale questions regarding participants' impressions of the text and tasks were analyzed and will be considered if the software program is modified for use in classroom settings.

3.6 Summary of Methods

This study attempted to determine whether vocabulary learning as measured by immediate and delayed posttests could be improved by a glossed text plus form, meaning, and use exercises combination as compared to a more conventional text plus dictionary use plus writing instructional approach. A further purpose of the study was to determine participant impressions of the treatments. The experimental results are presented in the next chapter.

Chapter 4

Results

4.1 Introduction

The primary purpose of the proposed research project was to determine whether English vocabulary words can be effectively learned through interaction with an authentic, gloss-embedded text plus a set of vocabulary exercises focusing on form, meaning, and use. The effects of this approach on learning and retention were compared to a reading plus dictionary use plus an opportunity to write on a related topic. Fifty-six international students enrolled in an intensive English program (IEP) at a large mid-Atlantic state university participated in this study as part of their reading course work.

Appendix A displays the descriptive statistics for the sample. Participant demographics were similarly distributed across conditions. Participants were evenly divided and randomly assigned to the Control and Experimental groups. Over half (53.6%) were in the “High-Intermediate” group. Ages ranged from 18 to 42 years ($Mdn = 25.0$ years). More women than men (55.4% versus 44.6%) participated in the study. The most frequent countries of origin were Korea (33.9%) and Japan (23.2%) with the most common first languages being Korean (33.9%) and Japanese (23.2%). Twenty percent reported knowing another language, other than English, with the most common second language being French ($n = 3, 5.4\%$).

Table 4-1 displays the psychometric characteristics for the ten additive vocabulary posttest scores. The Cronbach Alpha reliability coefficients ranged from $r = .68$ to $r = .85$ with a median coefficient of $r = .78$. These results suggest that the degree to which items were answered in a similar fashion was adequate.

Table 4-1: Psychometric Characteristics for the Additive Total Scores (N = 56)

	Number of Items	<i>M</i>	<i>SD</i>	Low	High	Alpha
Prior Knowledge Recognition # Checked	10	3.46	2.82	0	10	.82
Prior Knowledge Recognition + # Correct	20	12.80	3.26	5	20	.79
Immediate Vocabulary Test Recognition	10	9.34	1.25	5	10	.68
Prior Knowledge Recall # Checked	10	3.80	3.05	0	10	.85
Prior Knowledge Recall + # Correct	20	9.51	4.33	0	19	.81
Immediate Vocabulary Test Recall	10	5.71	2.54	0	10	.75
Immediate Vocabulary Test Total	20	15.05	3.38	6	20	.80
Delayed Vocabulary Test Recognition	10	8.25	2.01	3	10	.73
Delayed Vocabulary Test Recall	10	3.46	2.17	0	9	.69
Delayed Vocabulary Test Total	20	11.71	3.39	5	19	.76

The following section discusses the results of the statistical analyses, including between and within group posttest performance, activation of glosses, motivation, prior knowledge, educational level, IEP level, first language, and ratings of treatment helpfulness.

4.2 Learning Outcomes: Was the Text + Exercises Treatment Effective?

4.2.1 Group and Posttest Performance

Hypothesis One posited that participants in the experimental group would score higher on both the immediate and delayed vocabulary posttests than participants in the control group would. Experimental group participants performed significantly better than control group participants for immediate vocabulary posttests ($p = .004$) but no between-group differences were found for delayed vocabulary posttests ($p = .70$) (Table 4.3). These findings provided partial support for this hypothesis.

Table 4-2: Immediate and Delayed Posttest Total Correct Items: t Tests for Independent Means (N = 56)

Score	Group ^a	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Immediate Vocabulary Posttest Total # Correct	C	13.79	3.61	3.00	.004
	E	16.32	2.63		
Delayed Vocabulary Posttest Total # Correct	C	11.54	3.77	0.39	.70
	E	11.89	3.03		

^a Group: C = Control E = Experimental

4.2.2 Prior Knowledge and Posttest Performance

Hypothesis Two posited that participants in the experimental group would score higher on both immediate and delayed vocabulary posttests than participants in the control group would after controlling for prior knowledge. To test this, one-way ANCOVA tests were used for immediate posttest performance (Table 4-3) and delayed posttest performance (Table 4-4). In Table 4.4, participants in the experimental group had significantly higher scores ($M = 16.22$) than did control group participants ($M = 13.89$) on immediate posttests after controlling for prior knowledge. In Table 4-4, no significant differences ($p = .848$) were found based on treatment group for delayed posttests after controlling for prior knowledge. These findings provided partial support for this hypothesis.

Table 4-3: Immediate Posttest Performance Controlling for Prior Knowledge: ANCOVA (N = 56)

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared
Full Model	356.07	3	118.69	22.63	.001	.57
Prior Recognition Knowledge	3.35	1	3.35	0.64	.428	.01
Prior Recall Knowledge	142.55	1	142.55	27.18	.001	.34
Group ^a	63.80	1	63.80	12.16	.001	.19
Error	272.77	52	5.25			
Total	628.84	55				

^a Adjusted Means: Experimental Group ($M = 16.22$), Control Group ($M = 13.89$)

Table 4-4: Delayed Posttest Performance Controlling for Prior Knowledge:

Analysis of Covariance (N = 56)

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared
Full Model	200.23	3	66.74	8.01	.001	.32
Prior Recognition Knowledge	2.00	1	2.00	0.24	.626	.00
Prior Recall Knowledge	146.61	1	146.61	17.60	.001	.25
Group	0.31	1	0.31	0.04	.848	.00
Error	433.20	52	8.33			
Total	633.43	55				

^a Adjusted Means: Experimental Group ($M = 11.89$), Control Group ($M = 11.54$)

4.2.3 Recognition Item Performance

Hypothesis Three posited that participants in the experimental group would score higher on both immediate and delayed multiple-choice recognition items than would participants in the control group. Table 4-5 shows that experimental group participants scored significantly higher for immediate recognition ($p = .05$) but not for delayed recognition ($p = .57$). A ceiling effect was found on the recognition items on the immediate vocabulary posttest. Forty-seven participants scored 9 or 10 out of 10, indicating a limited range of difficulty for the test items. As a result, the immediate vocabulary posttest was unable to measure the entire range of possible achievement, limiting the usefulness of the data for analyzing learning gains. These findings provided partial support for hypothesis three.

Table 4-5: Immediate and Delayed Posttest Recognition Items: *t* Tests for Independent Means ($N = 56$)

Score	Group ^a	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Immediate Recognition number correct	C	9.00	1.57	.98	.05
	E	9.67	0.78		
Delayed test Recognition number correct	C	7.74	2.32	0.58	.57
	E	8.08	1.74		

^a Group: C = Control E = Experimental

4.2.4 Recall Item Performance

Hypothesis Four posited that participants in the experimental group would score higher on both immediate and delayed posttest recall items than participants in the control group would. Experimental group participants scored significantly higher than control group participants for immediate recall ($p = .004$) but no between-group differences were found for delayed posttest recall ($p = .81$) (Table 4-6). These findings provided partial support for this hypothesis.

Table 4-6: Immediate and Delayed Posttest Recall Items: *t* Tests for Independent Means (N = 56)

Score	Group ^a	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Immediate Vocabulary Test Recall Items # Correct	C	4.75	2.55	3.04	.004
	E	6.68	2.18		
Delayed Vocabulary Test Recall Items # Correct	C	3.39	2.20	0.24	.81
	E	3.54	2.19		

^a Group: C = Control E = Experimental

4.2.5 IEP Level and Posttest Performance

Hypothesis Five posited that participants in the experimental group would score higher on both the immediate and delayed vocabulary posttests than participants in the control group would, regardless of IEP class level. To test this for the immediate posttests, two-way ANOVA tests were performed using treatment group and IEP levels as the independent variables (Tables 4-7 and 4-8). A significant main effect was found for Group ($p = .02$), but not for IEP level ($p = .51$). No significant interaction effect was found ($p = .57$). Inspection of the means in Table 4.8 found experimental group participants ($M = 16.32$) to have higher scores than the control group participants did ($M = 13.79$).

Table 4-7: Descriptive Statistics for Immediate Posttest Score Based on Group and IEP Level:

Two-Way ANOVA (N = 56)

Group	IEP Level	<i>n</i>	<i>M</i>	<i>SD</i>
Control	Intermediate	6	14.00	2.68
	High-Intermediate	16	13.50	4.10
	Advanced	6	14.33	3.50
	Total	28	13.79	3.61
Experimental	Intermediate	7	14.86	3.39
	High-Intermediate	14	16.50	2.07
	Advanced	7	17.43	2.51
	Total	28	16.32	2.63
Total	Intermediate	13	14.46	2.99
	High-Intermediate	30	14.90	3.59
	Advanced	13	16.00	3.29
	Total	56	15.05	3.38

Table 4-8: Immediate Posttest Performance Based on Group and IEP Level: Two-Way ANOVA
(N = 56)

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared
Full Model	117.43	5	23.49	2.30	.06	.19
Group	64.19	1	64.19	6.28	.02	.11
IEP Level	13.96	2	6.98	0.68	.51	.03
Group X level	11.72	2	5.86	0.57	.57	.02
Error	511.40	50	10.23			
Total	628.84	55				

In Table 4-10, the full model accounted for 13% of the variance in delayed posttest performance. A significant main effect was not found for group ($p = .46$), but was found for IEP level ($p = .05$). No significant interaction effect was found ($p = .63$). Inspection of the means in Table 4-9 found intermediate level participants ($M = 9.69$) to have lower scores than either the high-intermediate participants ($M = 12.30$) or the advanced participants ($M = 12.38$). This combination of findings provided only partial support for this hypothesis.

Table 4-9: Descriptive Statistics for Delayed Posttest Score Based on Group and IEP Level:

Two-Way ANOVA (N = 56)

Group	IEP Level	<i>n</i>	<i>M</i>	<i>SD</i>
Control	Intermediate	6	9.50	3.15
	High-Intermediate	16	12.38	4.10
	Advanced	6	11.33	3.01
	Total	28	11.54	3.77
Experimental	Intermediate	7	9.86	3.13
	High-Intermediate	14	12.21	2.49
	Advanced	7	13.29	3.30
	Total	28	11.89	3.03
Total	Intermediate	13	9.69	3.01
	High-Intermediate	30	12.30	3.39
	Advanced	13	12.38	3.20
	Total	56	11.71	3.39

Table 4-10: Delayed Posttest Performance Based on Group and IEP Level: Two-Way ANOVA

(N = 56)

Source	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>	Partial Eta Squared
Full Model	82.20	5	16.44	1.49	.21	.13
Group	6.13	1	6.13	0.56	.46	.01
IEP Level	68.16	2	34.08	3.09	.05	.11
Group X level	10.11	2	5.05	0.46	.63	.02
Error	551.23	50	11.02			
Total	633.43	55				

4.3 Learning Outcomes: What Are the Effects of Prior Knowledge on Learning Outcomes?

4.3.1 Activating the Gloss, Performance, and Prior Knowledge

Hypothesis Six posited that significant correlations would exist between activating a word gloss, performance, and prior knowledge. In Table 4-11, three sets of correlations are displayed. These sets were for: (a) activating the gloss with the participant's test score ($n = 28$); (b) activating the gloss with prior knowledge ($n = 28$); (c) and test score with prior knowledge ($N = 56$). Table 4-11 displays the intercorrelations among these three scores. None of the intercorrelations were statistically significant at the $p < .10$ level. These findings do not support this hypothesis.

Table 4-11: Intercorrelations for Selected Scores (N = 56)

Score	1	2	3
1. Activated Gloss Total	1.00		
2. Multiple Choice Knowledge Test Total	-.07	1.00	
3. Prior Knowledge Test Total	.06	.11	1.00

* $p < .10$.

Table 4-12 displays the Cronbach alpha reliability coefficients for the three summated scores. All three scores had reliability coefficients of at least $r = .80$ which suggested adequate internal reliability.

Table 4-12: Psychometric Characteristics for Gloss, Posttest, and Prior Knowledge (N = 56)

Score	<i>M</i>	<i>SD</i>	Low	High	Alpha
Activated Gloss Total	8.89	4.16	1	19	.81
Immediate Vocabulary Test Total	15.05	3.38	6	20	.80
Prior Knowledge Test Total	7.27	5.40	0	20	.90

4.4 Treatment Outcomes: What Are the Effects of Treatment on Motivation?

4.4.1 Motivation

Hypothesis Seven posited that motivation, as measured by responses to two Likert-scale items on the feedback form, would correlate positively to performance on immediate and delayed posttests. The two items were 1) it is important to learn vocabulary, and 2) vocabulary helps with English. Table 4-13 displays the correlations for selected variables with immediate and delayed posttest scores. The aggregated feedback score was not related to either the immediate posttest score ($r = .04$) or the delayed posttest score ($r = .02$). These non-significant correlations provided no support for this hypothesis. The Cronbach alpha reliability coefficients for the aggregated score was $r = .85$ which suggested adequate internal reliability.

Table 4-13: Correlations for Motivation with Immediate and Delayed Posttest Scores (N = 56)

	Posttest Scores	
	Immediate	Delayed
Aggregated feedback score	.04	.02

Note. Aggregated feedback score had a Cronbach reliability coefficient of $r = .85$.

* $p < .10$.

4.5 Individual Variable Outcomes: What Are the Effects of Education Level, IEP Level, and L1 on Performance?

4.5.1 Education Level Performance

Hypothesis Eight posited that participants with higher levels of education would outperform participants with lower levels of education on immediate and delayed vocabulary posttests. In Table 4-14, education level was not significantly related to either the immediate posttest score ($r = .11$) or the delayed posttest score ($r = .15$). This provided no support for this hypothesis.

Table 4-14: Correlations for Level of Education with Immediate and Delayed Posttest Scores (N = 56)

	Posttest Scores	
	Immediate	Delayed
Highest Level of Education	.11	.15

* $p = .05$. ** $p = .01$. *** $p = .005$. **** $p = .001$.

4.5.2 IEP Participant Performance

Hypothesis Nine posited that higher IEP level participants would outperform lower IEP level participants on both the immediate and delayed vocabulary posttests. In Table 4-15, IEP level was not significantly related to the immediate posttest score ($r = .16$) but was positively correlated with the delayed posttest score ($r = .27$). IEP advanced level participants had higher scores and intermediate participants had lower scores on the delayed posttest. No clear pattern emerged on the immediate posttest. This provided partial support for this hypothesis.

Table 4-15: Correlations for IEP Level with Immediate and Delayed Posttest Scores (N = 56)

	Posttest Scores	
	Immediate	Delayed
IEP Level	.16	.27*

* $p = .05$. ** $p = .01$. *** $p = .005$. **** $p = .001$.

4.5.3 L1 Group Posttest Performance

Hypothesis Ten posited that no differences would exist in performance on immediate and delayed vocabulary posttests between L1 groups. To test this, one-way ANOVA tests were used to compare performance based on the students' first languages (Table 4-16). Significant differences were found for immediate performance ($p = .01$) but not for delayed performance ($p = .84$). Scheffe post hoc tests found for immediate performance that participants whose first language was Korean ($M = 16.89$) had a significantly higher performance than did participants with "Other" first languages ($M = 11.60$) ($p = .03$). This finding did not support this hypothesis.

Table 4-16: Selected Variables Based on First Language: One Way ANOVA Tests with Scheffe Post Hoc Tests (N = 56)

Scale	Language	<i>n</i>	<i>M</i>	<i>SD</i>	<i>F</i>	<i>p</i>
Immediate Vocabulary Posttest						
Total # Correct ^a	1. Korean	19	16.89	2.18	3.56	.01
	2. Japanese	13	14.23	3.52		
	3. Spanish	9	15.00	2.45		
	4. Chinese	10	14.40	3.89		
	5. Other	5	11.60	4.28		
Delayed Vocabulary Posttest Total						
# Correct ^b	1. Korean	19	12.16	2.65	0.36	.84
	2. Japanese	13	11.54	3.28		
	3. Spanish	9	12.11	3.55		
	4. Chinese	10	11.50	4.40		
	5. Other	5	10.20	4.60		

^a Post Hoc Tests: 1 > 5 ($p = .03$); no significant differences for any other pair of scores

^b Post Hoc Tests: No significant differences for any pair of scores

4.6 Treatment Group Feedback Outcomes: Does Group Affect Helpfulness Ratings?

4.6.1 Exercise Helpfulness

Hypothesis Eleven posited that participants in the experimental group would rate the helpfulness of the exercises in contributing to learning higher than participants in the control group would. Table 4-17 displays the t test for independent means comparing the two groups for their aggregated score. No significant difference was noted ($p = .42$). This result provided no support for this hypothesis. The Cronbach alpha reliability coefficients for the aggregated score was $r = .76$ which suggested adequate internal reliability.

Table 4-17: t Tests for Independent Means (N = 56)

Score	Group ^a	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>
Aggregated Score	C	3.98	0.53	0.82	.42
	E	3.88	0.44		

^a Group: *C = Control E = Experimental*

Note. The Cronbach alpha reliability coefficient for the aggregated score was $r = .76$.

4.7 Summary

Experimental group participants outperformed control group participants on overall immediate posttests (even after controlling for prior knowledge), immediate posttest recognition items, and immediate posttest recall items, but did not outperform the control group on the delayed posttests. Only group (experimental), and not IEP level, was found to affect performance on the immediate posttest. The reverse was found for the delayed posttest, where IEP level, but not group, was found to affect performance on the posttest.

Minimal correlations exist between clicking on a word, performance on the posttests, and prior knowledge. Motivation, as measured by two items on the feedback questionnaire, was not related to performance on immediate or delayed posttests.

Participants with higher levels of education did not outperform participants with lower levels of education on immediate or delayed posttests. Analyses indicate that high-intermediate and advanced level IEP participants outperformed intermediate level participants on the delayed, but not on the immediate, posttest.

Differences were found between L1 groups on performance on immediate, but not delayed, posttests; participants whose first language is Korean outperformed other language speakers.

Feedback analyses indicate that the experimental group participants did not rate the helpfulness of the treatment higher than control group participants did.

Chapter 5

Discussion

5.1 Introduction

In order to increase second language vocabulary size, and by extension, overall language proficiency, the present study investigated the usefulness of a gloss-embedded text plus exercises for the purposes of vocabulary learning. A discussion of the research findings, the limitations of the study, avenues for future research, and instructional and software design recommendations are presented.

5.2 Research Results

The results of this project were mixed. In this section, results of analyses are presented for immediate posttests; recognition and recall items; delayed posttests, gloss activation, prior knowledge, and performance; motivation and performance; level of education and performance; L1 and performance; IEP level and performance; and helpfulness ratings.

5.2.1 Overall Vocabulary Posttest Performance

It was hypothesized that participants in the experimental group would score higher on both the immediate and delayed vocabulary posttests than participants in the control group would. Analysis of the results show that participants in the experimental condition outperformed the control group on overall vocabulary posttests even when prior knowledge was controlled statistically. Although results on the delayed posttests remained higher for the experimental group, the superior performance was not statistically significant.

It was also hypothesized that experimental group participants would score higher on both the immediate and delayed vocabulary posttests than participants in the control group would, regardless of IEP class level. However, only the treatment group, and not the IEP level, was found to affect performance on the immediate posttest. The interaction between group and IEP level was not found to be significant on the immediate posttest, but on the delayed posttest, IEP level was found to affect performance on the posttest, but group membership did not, possibly indicating that English learning experience or proficiency was a more powerful factor determining performance over time than the treatment was. The data indicate that in the future, it would be interesting to examine the effects of the treatment at different levels.

Participant interaction with the vocabulary words was limited in this study to two sessions, and in only one session did participants study. It may be speculated that due to the limited interaction with the words, they were not fully “learned;” nevertheless, participants in the experimental group were able to outperform participants in the control group on immediate vocabulary posttests.

The experimental group’s stronger performance on immediate vocabulary posttests is in agreement with Holec’s 1980 findings that learner participation in the learning process is important in L2 vocabulary learning. This is likely due to the increased level of interaction experimental group participants had with the materials. The expanded interaction with the targeted vocabulary words presented by the materials which allowed interaction with the written form of the word, word parts, noticing through repeated encounters during the exercises, word meaning, and use, may also have increased the amount of input available (Nation, 2001), thereby explaining the experimental group’s higher performance.

The format and contexts of the definitions in the experimental condition of the present study did not appear to have contributed to vocabulary learning as evidenced by the lack of significant correlations between activating glosses and performance. This finding was in contrast

to other studies in which learners preferred definitions: in sentence format with examples (Cumming et al, 1994; Gettys, et al., 2001); definitions that were specific, simple, and direct (McKeown, 1993); and used several sentence contexts for words in addition to the definitions (Gipe & Arnold, 1979; Nist & Olejnik, 1995). Because the activation of glosses did not appear to affect performance, the superior performance of the experimental group on the immediate vocabulary posttest should then be attributed to interaction with the exercises.

The experimental group's superior performance on the immediate vocabulary posttest may be attributed to the reading plus exercises treatment. Paribakht and Wesche (1993) noted that participants in a reading plus vocabulary group outperformed a multiple exposure group when the focus on vocabulary learning was explicit. Intentional attention to the vocabulary words, the manipulation of the vocabulary words during exercises, and the inclusion of output exercises in the experimental group helped experimental group participants to focus on the input and the output of the vocabulary words, allowing them to process the words more deeply (Craik & Lockhart, 1972) than the control group did even though both groups were informed at the outset of the vocabulary posttests.

Another explanation for the experimental group's higher scores on the immediate vocabulary posttest is the increased amount of attention to the vocabulary words that the exercises provided (McLaughlin, 1990; Nation, 2001; Schmidt, 1990). Although participants in both groups were aware of the glossed words' presence on the posttests, the vocabulary exercises present in the experimental condition forced attention to the words that may not have been required in the control conditions. Participants in the experimental group interacted with the vocabulary words in a meaningful way that helped them to negotiate the meanings of the words. This negotiation, with its attendant processing, is an effective method of learning vocabulary (Ellis, Tanaka, & Yamazaki, 1994; Newton, 1995). The addition of different sentence and other contexts for the words and their meanings also contributed to learning (Gipe & Arnold, 1979;

Nist & Olejnik, 1995). The variety of exercises in the experimental condition not only also provided multiple exposures to the words, but also required that participants attend to different lexical features of the words, leading to elaboration and strengthening of knowledge (Paribakht & Wesche, 2000).

The treatment in this research project included extended vocabulary instruction, exemplified by explicit instruction of definitions and other contextual information, which has been shown to result in greater word learning than incidental exposure or embedded instruction alone (Coyne, McCoach, & Knapp; 2007). Beck, McKeown, and Kukan (2002) argue that extended vocabulary instruction provides rich information about words and their uses, multiple exposures, varying contexts beyond the texts within which they are found, and deep processing opportunities. Presenting opportunities for greater interaction with the vocabulary words in the experimental group supported the participants' efforts to learn.

Participants in the experimental condition also had the opportunity for multiple retrievals which strengthened learning (Baddeley, 1990). Because of the design of the materials, learners noticed, processed, and comprehended the words, then had the opportunity to retrieve them during the exercises; thus strengthening the memory of the words (Nation, 2001). Each opportunity to retrieve the words from long-term memory strengthens the retrieval paths that link the word forms and their meanings (Baddeley, 1990; Gagne et al., 1993; Gredler, 1992).

A possible reason that the experimental group did not outperform the control group by a greater margin is that the control group's task was to use their dictionaries which has been shown to be more effective than glosses when actually used (Gettys, et al, 2001; Hulstijn, et al, 1996). Participants in the control group were directed to use their dictionaries, most of which provided L1 definitions, which some studies have shown to be more effective than L2 definitions (Hulstijn, et al., 1996, Watanabe, 1997), such as those provided in the experimental group's glosses and exercises. This may have affected the outcomes of control-group performance on the immediate

and delayed posttests. Additionally, the control group was directed to produce a written text, which offers the potential production of the vocabulary words and has been shown to be of greater difficulty requiring greater depth of processing that should produce good results (Baddeley, 1990; Corson, 1983, in Nation, 1990; Nation, 1990). Therefore, the control group's treatment was already an effective one. The failure of the experimental treatment to produce results far outweighing the control treatment, then, does not indicate a lack of experimental treatment effectiveness. On the contrary, it may be a testament to the strength of both treatments.

Although analysis of the data shows that the experimental treatment did not lend strong support for extended vocabulary learning, as evidenced by weaker performance on the delayed posttest compared to performance on the immediate posttest, it does indicate that the addition of form, meaning, and use exercises can result in greater immediate learning. Coyne, et al. (2007) argue that seemingly insignificant gains in vocabulary, such as those that do not appear on posttests, provide incremental increases in word knowledge that become meaningful over time and with additional exposures.

5.2.2 Recognition and Recall

The interactions with the vocabulary words in the experimental group's exercises were hypothesized to result in improved recognition and recall on both immediate and delayed posttests. Participants in the experimental group scored significantly higher on recognition and recall of vocabulary words on immediate posttests but not on delayed posttests. This outcome may be the result of the limited number of encounters participants had with the words during the exercises (Nation, 2001). Knowledge of the vocabulary words may have been processed through working-, short-term-, and long-term memory, but because of the limited number of exposures to the words within the practice session and the lack of spaced practice, participants may not have developed multiple paths of retrieval, and were therefore unable to access the knowledge stored in long-term memory (Gagne et al., 1993; Pressley & McCormick, 1995).

Performance on immediate and delayed posttest recognition items was superior for both the treatment and control groups to performance on the recall items. Recognizing a word is easier than producing it; even with partial knowledge, a test taker may be able choose correctly from a field of items (Baddeley, 1990; Corson, 1983, in Nation, 1990; Nation, 1990, Nation, 2001). Recalling a word from the mental lexicon in long-term memory for production requires that the word be strongly connected to other related words and concepts; thus requiring a greater depth of processing (Groot, 2000). In other words, productive (recall) vocabulary requires 50-100% greater effort than receptive (recognition) vocabulary does (Baddeley, 1990; Corson, 1983, in Nation, 1990; Nation, 1990).

5.2.3 Delayed Posttests

The findings that the results on the immediate posttests were higher than those for the delayed posttests were not surprising. Immediate posttests measure the amount of learning that occurs as a result of the treatment (Borg & Gall, 1989), whereas delayed posttests are administered to examine long-term retention rates (Groot, 2000; Ulanoff & Pucci, 1999). The decreased performance on the delayed posttests was likely due to forgetting which depends on interference: the amount, complexity, and type of information competing for processing during retention (Anderson & Neely, 1996; Bjork, 1992). Therefore, although the experimental group still retained more vocabulary words than the control group, numerically but not statistically, the decreased performance of both groups over time was to be expected.

The lack of statistically significant higher scores on delayed posttests for the experimental group suggests that the information was either not processed to a sufficient depth to persist longer than one week (Craik & Lockhart, 1972; Groot, 2000) or the lack of sufficient spaced learning opportunities. Spaced learning, which increases the amount of time between each encounter with the to-be-learned words, helps hone meaning while increasing the number of exposures to the words; thus increasing the likelihood that participants would have remembered

more of the words on the recognition and recall portions of the delayed vocabulary posttest (Nation, 2001; Pimsleur, 1967). In several learning studies, spaced practice proved superior to massed practice (Gagne, et al., 1993). Thus, the lack of increased spacing may have reduced the effectiveness of the treatments.

When long-term learning is the goal of vocabulary study, immediate vocabulary posttest scores are of little practical significance. The immediate tests measured surface recognition and some recall. However, if the associations between the words and their definitions are not strong, the delayed posttest scores will not be high (Groot, 2000). When scores fall considerably between the immediate and delayed posttests, they have no predictive value of the long-term retention of the words (Groot, 2000). Therefore, it is likely that the experimental treatment failed to lead to sufficient learning differences to overcome the decay typical of vocabulary learning treatments over time.

5.2.4 Activation of Glosses, Performance, and Prior Knowledge

Significant correlations were expected to exist between the activation of glosses, performance, and prior knowledge. To ensure that successful posttest performance was not the result of prior knowledge of the to-be-learned words, participants were asked to indicate on the immediate posttest whether the word was known to them. For test score and prior knowledge, 6 of 20 correlations were found to be significant, indicating that some relationship may have affected posttest outcomes. However, in anticipation of this possibility, statistical procedures were used to control for prior knowledge so that results on between-group posttest scores could be accurately measured. Even with this statistical control, the experimental group outperformed the control group on immediate posttests.

To ascertain whether participants in the experimental condition used the glossed definitions included in the texts, a tracking device in the software recorded activations of glossed words. In the relationship between the activation of glosses and test scores, however, only 2 of

20 correlations were significant. Prior research shows glossing to have a positive effect on vocabulary learning, in part because the word appears again in the gloss; thus increasing frequency of exposure to the words even within a single context (Chun & Plass; Hulstijn, et al, 1996; Jacobs et al, 1994; Myong, 1995, in Nation, 2001 ; Watanabe, 1997). The results of the present study, however, suggest that the activation of the glosses alone did not lead to greatly increased posttest performance.

In the relationship between the activation of glosses and prior knowledge, 2 of 20 correlations were significant, suggesting that experimental group participants who had prior knowledge of the to-be-learned words were not likely to activate the glosses except perhaps to confirm their knowledge of the words or to ascertain that the knowledge they possessed was valid within the context of the story.

5.2.5 Motivation and Performance

Motivation, as measured by two items on the feedback questionnaire, was hypothesized to correlate positively to performance on immediate and delayed posttests, but interestingly, was not related to performance on either. Participants were asked to respond to the following statements: “it is important to learn vocabulary” and “vocabulary helps with English.” This result suggests that either participants did not perceive the vocabulary learning activities to contribute to their vocabulary learning because they knew that it was research and they perceived the activities to be unimportant to their vocabulary development, or they did not find the vocabulary learning activities to be helpful in learning vocabulary. It may also be interpreted as suggesting that even if participants were not motivated to learn vocabulary, they were still able to learn it in both groups, with superior performance in the experimental treatment.

5.2.6 Education Level and Performance

Based on previous research, it was hypothesized that participants with higher levels of education would outperform participants with lower levels of education on immediate and

delayed vocabulary posttests. However, participants with higher levels of education did not outperform participants with lower levels of education, thus failing to support prior research. The finding is contrary to Cummins (in Freeman & Freeman, 1994), Odlin (1996), and later Jiang & Kuehn (2001) who found that L1 proficiency, as measured by level of education, influences the development of L2 proficiency. In another study, students' total years of L1 education was positively correlated to L1 and L2 vocabulary, and learners with greater L1 levels of education were thought to progress more quickly in learning academic knowledge than those who have less education (Jiang & Kuehn, 2001). The failure of the present study to support the prior findings suggests that 1) there was an anomaly in the data, 2) L1 educational levels are not related to L2 vocabulary development, or 3) that the experimental treatment mitigated differences in educational levels and led to a more equalized performance on the posttests because of the features of the treatment itself. Further study is necessary to determine whether the final explanation can be confirmed.

5.2.7 IEP Level, Group, and Posttest Performance

The researcher posited that higher IEP level participants would outperform lower IEP level participants on both the immediate and delayed vocabulary posttests. As reported earlier, the experimental group outperformed the control group on the immediate posttest. Surprisingly, inspection of the results indicates that on the immediate posttest, both the intermediate and the advanced IEP levels outperformed the high-intermediate level in the control group. This unexpected performance outcome disappeared on the delayed posttest, and may be explained as an anomaly in the data or because the control group high-intermediate participants did not perform up to their abilities on the immediate posttest. Based on the findings of McLaughlin, et al, (1983), Knight (1994), and Hulstijn, (1997), it would be expected that the higher the IEP level, the higher the performance scores on the posttest. More support may be needed for intermediate level participants who did not benefit very much from the treatment.

On the delayed posttest, analyses indicate that overall, advanced and high-intermediate level IEP participants outperformed the lowest group included in this study, the intermediate level participants. A possible explanation of this outcome is that the glosses in the present study were provided in the participants' second language, English, because of the numerous first language backgrounds of the participants. Research conducted after data from the present study was collected found that L2 glosses were more effective for higher-proficiency learners than they are for lower-proficiency learners, who prefer glosses in their L1 (Miyasako, 2002), possibly because the word-to-concept connections are stronger for the L1 than they are for the L2 (Yoshii, 2006). Memory for the newly-learned words may have degraded over time at a greater rate for the lower-proficiency participants because the conceptual links between the L1 and concepts are typically higher than are the L2 and the concepts (Kroll & Stewart, 1994; Kroll & Sunderman, 2003). In addition, Coyne, et al., (2007) suggest that extended vocabulary instruction, used in the present study, favors learners with higher receptive vocabularies, which the higher IEP level students could be assumed to have.

A surprising finding on the delayed posttest was that advanced participants in the control group performed worse than high-intermediate participants did. This may be 1) an anomaly in the data, 2) evidence that the treatment did not hold for the advanced group, or that 3) the advanced control group participants did not perform up to their abilities on the delayed posttest. Additional research would be needed in order to explain this finding.

5.2.8 L1 Group Posttest and Performance

In this study, it was expected that differences would not exist in performance on immediate and delayed vocabulary posttests between L1 groups. The researcher was interested in whether the reading plus exercises approach to vocabulary learning would be equally effective for all learners from the variety of L1 backgrounds represented in the IEP courses at the university at which the research was conducted. In the present study, differences were found between L1

groups on performance on immediate, but not delayed, posttests. Those participants whose first language is Korean outperformed speakers of other languages. Previous research has found that similarities between the learners' first and second languages affect the transferability of the words from L1 to L2 (Nation, 1990). Transfer from the L1 to the L2 may be positive, neutral, or negative, affecting performance (Brown, 1994). Other research suggests that the L1 interferes with language learning when the target language is similar to the L1 (Jiang & Kuehn, 2001). The results of the present research suggest that either 1) there was an anomaly in the data, 2) that Korean speakers have superior vocabulary learning strategies that they employed during the study, or 3) that because Korean is not similar to English, it did not interfere with vocabulary learning in this study. This final explanation is not likely because a number of other participant L1s are also dissimilar to English, making the lack of interference between the languages an unlikely explanation for the results. Further study is needed to ascertain the reasons for the results found here.

5.2.9 Exercise Helpfulness

The researcher hypothesized that because the experimental treatment required a greater amount of interaction with the to-be-learned vocabulary words, the experimental group would rate the helpfulness of the treatment higher than control group participants would. However, analysis of the feedback data indicates that there was no significant difference between group ratings of helpfulness. This may be because participants were not given their test results until after they completed their ratings at the conclusion of the study. Therefore, participants did not have the opportunity to see their performance scores on the immediate and delayed posttests before they rated the helpfulness of the exercises for vocabulary learning. Another possible explanation is that because the form, meaning, and use exercises were novel compared to the more conventional control treatment, experimental group participants may not have perceived them to be valuable to their vocabulary learning. They may have been unsure of their

effectiveness; whereas the more conventional control treatment used elements more familiar to participants who know its effectiveness from experience.

5.3 Limitations

Several limitations to this study were revealed through the analyses of the results. Not all of the beneficial elements that are known to promote learning were included in the present study in an attempt to keep the data manageable and the analyses clear. Limitations include a lack of the following: sufficient spacing between presentations, an additional productive vocabulary assessment, a reading comprehension assessment, a second delayed posttest, and a post-study participant interview.

As a result of the short time allotted for data collection, the study included spaced learning only in short gaps between encounters with the words during interaction with the software, but because that interaction was completed within one session, intervals between exposures to the words did not extend much past one hour. Repeated exposure to the to-be-learned words at certain intervals is necessary for long-term retention (Groot, 2000). The research design, therefore, was hampered by not allowing increased spacings between encounters as Baddeley recommends (1990). Therefore, it is unlikely that a single presentation of the materials, however effective they may be, is sufficient for long-term retention. Increasing intervals would have been more beneficial to the participants (Baddeley, 1990) and, if used, may have impacted the results of the vocabulary posttests differently.

A second limitation of this study was that it lacked a second productive measure of vocabulary. In real-world situations, learners are called upon to produce vocabulary in novel ways that require semantic and grammatical correctness as well as appropriateness. Although this study did include a productive measure in the form of a recall task on the posttests, a more

substantial production task requiring the use of the words in a context generated by the participants may have been quite telling of their knowledge of the form, meaning, and use of the words.

A third limitation is that the present study also failed to include an assessment of reading comprehension. It was excluded from the study in order to reduce participant fatigue, simplify both the data collection process and analyses, and focus on vocabulary learning. The inclusion of such a measure might have shown whether an increased knowledge of the vocabulary words contributed to greater comprehension of the text as a whole, which is, after all, the purpose of vocabulary learning.

A fourth limitation of the study is the lack of a second delayed posttest – one that assesses participant recognition and recall of the target vocabulary words after two weeks or even a month. Such a posttest could help determine whether the text plus exercises treatment can help participants learn and retain vocabulary to meet real-world usage demands that may not appear until well after the experimental learning interaction with the vocabulary exercises.

A fifth limitation of the study was the lack of post-study interviews with participants to ask for greater, more detailed explanations of results and responses that would not necessarily be addressed on the feedback form.

5.4 Suggestions for Future Research

The results of this study, as well as its limitations, suggest several lines of future research, including further investigations of the effects of the glossed text plus exercise treatment on spaced learning; vocabulary production; reading comprehension; recognition and recall; numbers of exposures, glosses, and exercises; word family members, and L1 and L2 glosses and exercises.

One suggestion for future research is the investigation of software-based design features that incorporate spaced learning presentations over increasingly greater spans of time. Results of the analyses suggest that this may be especially important for intermediate level IEP participants, who appeared to require greater support in order to benefit more greatly from the treatment. This line of inquiry would be helpful to pursue in order to meet learners' needs for multiple exposures and spaced practice, which should lead to greater vocabulary retention (Baddeley, 1990). Software-based exercise design elements could include increasingly delayed time spans by recycling vocabulary in subsequent texts for additional exposures, and in subsequent posttests to ascertain whether learners can still correctly recognize or recall the meaning – particularly on posttests delayed by more than one week.

Although the present study did include some productive elements of vocabulary learning in the form of recall tasks on the posttests, it did not include a component that assesses whether participants could spontaneously produce the word accurately in an appropriate context. Future research might investigate whether interactions with glossed texts plus exercises including form, meaning, and use elements lead to enough learner knowledge and confidence to produce the target vocabulary words spontaneously in a posttest writing task related to the stimulus text. Since one of the goals of vocabulary learning is not only increased comprehension (receptive knowledge), but also increased production of words and texts, this line of research could prove fruitful.

A third useful direction for future research would be the investigation of the effects of multi-media gloss-embedded texts plus explicit vocabulary learning exercises focusing on form, meaning, and use on the comprehension of those same texts. Such investigations could help determine the usefulness of vocabulary learning exercises on the development of real-world demands for the comprehension of words and texts.

A fourth useful direction for future research is to ascertain whether the difference in performance on the vocabulary posttests between recognition and recall items can be mitigated by different exercises featuring different manipulations of the words. Because recall is more difficult than recognition (Baddeley, 1990; Corson, 1983, in Nation, 1990; Groot, 2000; Nation, 1990; Nation, 2001), but is required in real-world language use, it would be beneficial to investigate additions to the exercises that can increase the recollection and production of words.

A fifth feature that could be helpful to explore in future research is the relationship between the number of exposures to the to-be-learned words, the number of times glosses are activated, and/or the number of exercises learners engage in on the permanence of words as measured on immediate and increasingly delayed vocabulary posttests, especially on delays of more than one week.

A sixth possible avenue for future research is the investigation of the effect of word manipulation form-meaning exercises on vocabulary growth. Although the present research did include exercises involving members of the same word families, learners were not specifically exposed to tasks that encouraged them to think about, manipulate, or use different affixes on the to-be-learned words. The inclusion of such exercises might prove helpful to language learners in the expansion of their vocabularies. After learning the meanings of roots and affixes associated with the targeted vocabulary words as part of the exercises, the effects on word family vocabulary growth could be measured.

A seventh useful direction for future research is the investigation of L1 glosses paired with exercises and/or an increased number of exposures on lower level IEP participants' posttest performance. Because participants in the lower IEP level did not perform as well as those from higher levels on the delayed vocabulary posttest, future research investigating differential effects of L1 glosses and exercises for different proficiency levels could be useful.

5.5 Instructional Recommendations

The present study supports the notion that all three aspects of word learning – form, meaning, and use – can be effectively incorporated into instruction in order to improve vocabulary learning, at least for short durations.

The experimental results show that extended, explicit instruction was effective in helping participants learn new vocabulary words in the short term. Researchers and practitioners have long debated the value of providing direct instruction of vocabulary because of the sheer number of words needed to communicate effectively. Direct instruction can help supply learners with a meaningful proportion of the words they need because it is effective, and some learners are less likely to infer word meanings from incidental exposure (Coyne, et al., 2007). Because teachers are often limited by time constraints, the addition of vocabulary learning assignments outside of class in the form of text-embedded glosses and explicit vocabulary exercises can increase the amount of interaction learners have with second language vocabulary, and thus, help to increase second language proficiency.

Teachers should also be prepared to train their students in the use of electronic glosses and exercises. Learners can benefit from metalinguistic awareness (O'Malley & Chamot, 1990; Nunan, 1995), so some explanation of why glosses and interaction with form, meaning, and use exercises assist in the learning of vocabulary could also be beneficial to students. Such understanding on the part of the students may lead to greater diligence in exercise completion, motivation to perform the exercises to the best of their abilities, and possibly greater learning gains from the exercises due to increased attention and effort.

5.6 Software Design Recommendations

Recommendations for the inclusion of several elements in vocabulary learning software include gloss-embedded texts plus form, meaning, and use exercises; spaced learning; and multiple exposures.

One recommendation for software developers to help improve second language vocabulary learning is to integrate exercises that allow learners to interact with form, meaning, and use elements of to-be-learned vocabulary words. Not only do exercises allow learners time to interact with the vocabulary words, but when words are presented in different contexts, as in a variety of exercises, learners have multiple opportunities to process the information. The results of the present study indicate that interaction with glossed texts plus form, meaning, and use exercises was even more beneficial to participants than text plus dictionary use plus production, all of which have been shown to be effective themselves.

A second recommendation for inclusion in software is spaced, or distributed, presentation of vocabulary words. Learning may be improved by increasing the number and length of time between exposures to the to-be-learned vocabulary words. In the present study, posttest performance, and thus, learning, was hampered by the lack of increased spacing of learning exposures. To overcome this limitation and increase vocabulary learning, spaced learning events should be incorporated into vocabulary learning software. With several presentations of the vocabulary words, encoding variability is more likely than in single or massed presentation as were used in this study. Spaced learning can be accomplished by recycling words in exercises in subsequent tasks or including previously learned words on subsequent posttests. Repeated exposures to the vocabulary words over time, both within a set of exercises and across tasks or even texts, produce lasting, retrievable knowledge. Each presentation of the vocabulary words potentially encourages attention to different aspects of the items and different ways of studying

the content, which can result in a richer representation of the newly-learned items (Gagne, Yekovich, & Yekovich, 1993; Pressley & McCormick, 1995).

Repetition of the vocabulary words in the form of multiple exercises, such as those used in the present study, is useful to learners and should be incorporated into vocabulary learning software. The repetition allows learners to benefit from multiple exposures to the words, which can bolster strength of association and encourage the new information to be stored with related items in long term memory, thus increasing the potential number of retrieval pathways to the vocabulary words (Paivio, 1986). When words are presented in different contexts, as in a variety of exercises, the varied multiple exposures provide additional opportunities to process the information, which allows for greater instantiation of the newly-learned words (Alexander, et al., 1991), and exercises that highlight the elements of a word's form, meaning, and use also allow for greater depth of processing of the words through the use of noticing, retrieving, and generating (Craik & Tulving, 1975; Nation, 2001).

5.7 Conclusions

Participants in both treatment groups benefitted from inclusion in the present study. Participants in the control group, which received no direct instruction on the vocabulary words, were at least exposed to new vocabulary and were encouraged to investigate their meanings by using their dictionaries and producing them in their own writing. Participants in the experimental group had the opportunity to interact with the vocabulary words, via exercises, to develop knowledge of their forms, meanings, and uses. Participants in both groups were exposed to the words again during the posttests. Even if participants came away from the study with incomplete knowledge of the target vocabulary words, the interaction with the words helped to create an initial representation of the words' meanings, which can be built upon through later exposures to

the words (Biemiller & Boote, 2006). Overall, experimental group participants learned more vocabulary words as illustrated by performance on an immediate vocabulary posttest. However, this learning advantage, while still greater, was not statistically significant on delayed posttests. This lack of continued advantage may well have been an artifact of the experimental design.

This study, along with others carried out subsequently, has confirmed the effectiveness of gloss-embedded texts paired with explicit vocabulary learning exercises in second language vocabulary learning, at least for short-term learning. The results of the present research assist in the argument for the further development of interactive, software-based vocabulary learning activities that offer learners opportunities to activate glosses for unknown words; enhance understanding of the form, meaning, and use of those words; connect new to old information; increase the number of possible retrieval pathways; and to enhance recognition, recall, and production of newly-learned words – in other words, the tasks language users are asked to perform on a regular basis.

Because language learners need to make sense of text or to express meaning, direct, extended instruction that incorporates elements known to promote learning such as noticing, authentic materials, multiple exposures, spaced learning, and instruction on the form, meaning, and use of words has a place in every language classroom, or when that is too time intensive, at least in out-of-class vocabulary learning assignments.

Future research in vocabulary learning treatments that include texts plus exercises may be helpful in determining how learners may best be supported by vocabulary learning materials and how those materials should be designed. If the present study's shortcomings in effectiveness over longer durations can be overcome with further refinements, then the development and use of texts plus explicit form, meaning, and use exercises may well have a positive role to play in second language learning.

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Appendix A

Participants: Frequency Counts for Selected Variables Based on Group

Frequency Counts for Selected Variables Based on Group (N = 56)

Variable	Category	Control		Experimental	
		<i>n</i>	%	<i>n</i>	%
		<i>n</i> = 28		<i>n</i> = 28	
IECP Level	Intermediate	6	21.4	7	25.0
	High-Intermediate	16	57.1	14	50.0
	Advanced	6	21.4	7	25.0
Age	18-22 years	7	25.0	8	28.6
	23-27 years	15	53.6	8	28.6
	28-32 years	5	17.9	9	32.1
	33-37 years	1	3.6	2	7.1
	38-42 years	0	0.0	1	3.6
Gender	Male	14	50.0	11	39.3
	Female	14	50.0	17	60.7

Table Continued

Table Continued

Variable	Category	Control		Experimental	
		<i>n</i>	%	<i>n</i>	%
		<i>n</i> = 28		<i>n</i> = 28	
Country of Origin					
	Korea	8	28.6	11	39.3
	Japan	7	25.0	6	21.4
	Saudi Arabia	2	7.1	0	0.0
	Venezuela	5	17.9	2	7.1
	Oman	0	0.0	1	3.6
	Mexico	1	3.6	1	3.6
	Turkey	0	0.0	1	3.6
	Taiwan	3	10.7	2	7.1
	China	1	3.6	3	10.7
	Iran	1	3.6	0	0.0
	Hong Kong	0	0.0	1	3.6

Table Continued

Table Continued

Variable	Category	Control		Experimental	
		<i>n</i>	%	<i>n</i>	%
		<i>n</i> = 28		<i>n</i> = 28	
First Language	Korean	8	28.6	11	39.3
	Japanese	7	25.0	6	21.4
	Arabic	2	7.1	1	3.6
	Spanish	6	21.4	3	10.7
	Kurdish	0	0.0	1	3.6
	Chinese	4	14.3	5	17.9
	Farsi	1	3.6	0	0.0
	Cantonese	0	0.0	1	3.6
Has Second Language	No	22	78.6	23	82.1
	Yes	6	21.4	5	17.9

Table Continued

Table Continued

Variable	Category	Control		Experimental	
		<i>n</i>	%	<i>n</i>	%
		<i>n</i> = 28		<i>n</i> = 28	
Second Language	Turkish	0	0.0	1	3.6
	Taiwanese	1	3.6	0	0.0
	Cantonese	0	0.0	1	3.6
	Khodemani	1	3.6	0	0.0
	Chinese	0	0.0	1	3.6
	French	2	7.1	1	3.6
	Japanese	0	0.0	1	3.6
	Tagalong	1	3.6	0	0.0
	German	1	3.6	0	0.0
	No second language	22	78.6	23	82.1

Appendix B

Background Questionnaire

1. What is your name? _____
 2. What level are you in at the IECF? 2 3 4
 3. What is your age? _____
 4. Are you male or female ?
 5. What country are you from? _____
 6. What is your first language? _____
 7. Do you speak any other languages? yes no
- If yes for #7, which language(s)? _____
8. How many years (total) have you studied English? _____
 9. How many months or years have you been in the United States (total)? _____
 10. Have you spent time in other English-speaking countries? yes no
- If yes for #10, how long were you there? _____
11. What is your highest level of education? I graduated from high school
- I spent some time in college
- I graduated from college
- I have a Master's degree
- I have a Ph.D.

Appendix C

Written Protocols (Control and Experimental Groups)

Vocabulary Learning Study Control Group Protocol

Thank you again for agreeing to help with the data collection for my dissertation. While I am in the computer lab with the students in the experimental group, the students in the classroom with you will have a few tasks to complete. I will provide you with all of the necessary materials.

Day 2 (1-2 hours)

1. I will come to your class to give the students their secret numbers and take about half of them to the computer lab with me. The rest will remain in the classroom with you.
2. Please remind students that the exercises will be followed by a vocabulary posttest.
3. Please give the students the paper titled “Learning to Read.” Students should write their number in the upper right hand corner of the page on all of the papers.
4. Please read the directions on the top of the page to the students. They can use their dictionaries while they read.
5. As students finish the reading (they can go at their own pace), please give them the paper titled, “Write an Essay about Reading.” Please instruct them to read and follow the directions. I will provide writing paper. Students can use their dictionaries while they work.
6. When they have finished writing (again, they can go at their own page), please collect the “Learning to Read” and the “Write an Essay about Reading” papers.
7. Please give them the paper titled, “Vocabulary Test.” Please instruct them to read and follow the direction carefully (especially direction #3). Of course, they can not use their dictionaries during the test.
8. When they have completed the test, please collect them so that they can not change their answers. They are now finished.

Day 3 (approximately 20 minutes, one week after Day 2)

Either I can come back to your class for the final data collection, or I can just give you the forms and you can do it. Please remind students to write their numbers in the upper right hand corner of the papers.

1. Please give students the paper titled, “Vocabulary Test.” This will be the same as the one that they took on day 2. Please instruct them to read and follow the directions carefully. Of course, they cannot use their dictionaries during the test.
2. When they finish the test, please collect them so that they cannot change their answers.

3. Please give them the paper titled, "Feedback Questionnaire." Please instruct them that there are additional questions on the back of the form.
4. When they have completed the questionnaire, they are finished. Thank you for your help.

Vocabulary Learning Study Experimental Group Protocol

Day 2 (1-2 hours)

1. Go to classrooms to give the students their secret numbers and take about half of them to the computer lab. The rest will remain in the classroom with their instructors.
2. Remind students that the exercises will be followed by a vocabulary posttest.
3. Help students access the website containing the text, exercises, and posttests. Students should enter their number on the access page.
4. Read the directions on the top of the page to the students and let them practice clicking on bold-lettered words to practice activating the glosses.
5. Instruct students to read and follow the directions at the start of each section of the text, exercises, and posttest. Allow students to go at their own pace.
6. When they have finished the reading and exercises, direct their attention to the vocabulary test instructions and answer any procedural questions they have.
7. When they have completed the test, check to make sure that the information is stored in the software. They are now finished.

Day 3 (approximately 20 minutes, one week after Day 2)

Either go back to the classrooms for the final data collection, or give the instructors the forms to have their students complete. Remind students to write their numbers in the upper right hand corner of the papers.

1. Give students the paper titled, "Vocabulary Test." This will be the same as the one that they took on day 2. Instruct them to read and follow the directions carefully. Of course, they can not use their dictionaries during the test.
2. When they finish the test, collect them so that they can not change their answers.
3. Give them the paper titled, "Feedback Questionnaire." Instruct them that there are additional questions on the back of the form.
4. When they have completed the questionnaire, they are finished.

Appendix D

“Learning to Read” Prompt

Control Group Prompt

Directions: Read the story below. Use your dictionary to look up any of the words in **bold** lettering that you don't know to see a definition and an example sentence containing the word. Pay attention to these words; you will be tested on them later.

Experimental Group Prompt

Directions: Read the story below. Click your computer mouse on the words in **bold** lettering to look up any words you don't know to see a definition and an example sentence containing the word. Pay attention to these words; you will be tested on them later.

In first grade, I had the same teacher that my sister had four years before. Janet had been Mrs. Maniere's **pet**, and it did not take me long to understand that I had to work hard if I wanted her to like me too. Janet was a good reader and was ahead of her class in that subject. She had taught herself to read before she even started **kindergarten**. I, on the other hand, had not. When we began to study the alphabet seriously, the letters "b" and "d" became big **obstacles** for me. I got them confused when they were written small. In class, when I was asked to **identify** them, I got them wrong and felt bad. I began to fear that if I continued to make mistakes, Mrs. Maniere would never like me.

I began to spend a **considerable** amount of time practicing the alphabet by myself. It was then that I began my life-long practice of thinking too much. The reason I was having trouble with "b"s and "d"s was that when they are written small, they are **mirror images** of each other. I had already learned that things are backwards in mirrors, and so I thought that a 'b' should really be a 'd,' and a 'd' should really be a 'b'. When I discovered that I was wrong, I no longer had any trouble **perceiving** the difference between them.

I did, however, develop a new reading problem. I just could not finish our **initial** reading book. Although I liked the story and the pictures in the book, "We Feed a Deer," that book was

not my friend, and it made my life difficult. While other students moved on to the next book, and the ones after that, I still could not get all the way through my book without getting **stranded**. I fell behind the other students in my class, and I was put in the "slow" reading group.

Mrs. Maniere called my parents in for a **consultation**. She was beginning to worry that I would never learn to read and thought that maybe something was wrong with me. She talked about her fears and **exasperation** with my parents. She wondered why I could read a word on one page, but when I saw it again on another, I could not read it. Did I have a problem with my head, with **phonics**, or with my eyes?

My sister started spending extra time with me at home, practicing. I understood that my reading problems were big if my sister, who **detested** me, was willing to help. I worked with her, trying again and again to understand the rules of reading. Sometimes she was not very nice to me and would **sigh** very loudly and roll her eyes when I made the same mistake for the 12th time.

I could have quit, I guess, but by then I really wanted to learn the secrets of the rules of reading. I continued to practice, to think about reading, and to try to understand the rules until it finally **dawned on** me that the same word could be used twice. I had been unable to read all the way through my book because I stopped whenever I saw a word that looked the same as one I had already read. There were so many words, I thought, why would any of them **occur** twice? I thought that when I saw the same word a second time, that it must really be a different word, and so I tried to guess what it could be and how to say it. **Over analysis** had again made trouble for me.

Once I made this discovery, I successfully finished "We Feed a Deer." I did not even slow down at the word "**antlers**." I was then able to go on to the next book, "Here Come the Dogs." Now that I understood how it all worked, I **accelerated** through all the "baby" books and ended the school year reading a thick, more grown-up book in the top reading group.

I think now that my love of reading comes from the difficult time that I had learning how to do it. If I had been able to learn it as easily as my sister did, I probably would not have felt that it was an **accomplishment** at all. Learning to read was difficult for me, but because it was, I learned to love the secrets that only reading can tell me.

2. consultation - (noun) a meeting used for discussions or making decisions.

Sample sentence: My professor met with me for a consultation on my final project.

FORM

Spoken

KON sul TA shun

Written

Directions: Identify the correct spelling of the vocabulary word.

a) konsultation b) consultation c) concultasion

Word Parts

Directions: Place the different forms of the word *consultation* into the correct category or categories below. Use these forms: consult, consultation, consultatively, and consulting.

Noun	Verb	Adjective	Adverb
consultation	consult	consulting	consultatively

MEANING

Form-meaning connection

Directions: Choose the best definition for the word.

consultation a) a meeting
 b) a government agency
 c) an insult

5. pet - (noun) a person or thing that is someone's favorite.

Sample sentence: Helping poor people is my pet cause.

FORM

Spoken

PET

Written

Directions: Identify the correct spelling of the vocabulary word.

a) pet b) pat c) bet

Word Parts

Directions: Place the different forms of the word *pet* into the correct category or categories below.

Use these forms: pet, pet, pet, and X.

Noun	Verb	Adjective	Adverb
pet	pet	pet	X

MEANING

Form-meaning connection

Directions: Choose the best definition for the word.

pet

a) a bowl used for cooking

b) a favorite

c) a hole

6. exasperation - (noun) the feeling of being irritated or angry.

His daughter's bad behavior caused the father endless exasperation.

FORM

Spoken

eks ASS per A shun

Written

Directions: Identify the correct spelling of the vocabulary word.

a) exasperashion b) ecksasperation c) exasperation

Word Parts

Directions: Place the different forms of the word *exasperation* into the correct category or categories below. Use these forms: exasperate, exasperating, exasperatingly, and exasperation.

Noun	Verb	Adjective	Adverb
exasperation	exasperate	exasperating	exasperatingly

MEANING

Form-meaning connection

Directions: Choose the best definition for the word.

exasperation

- a) feeling afraid
- b) feeling happiness
- c) feeling angry

10. phonics - (noun) a way of learning to read, based on the spelling of words.

Sample sentence: You can buy a phonics game to teach children how to read.

FORM

Spoken

FON iks

Written

Directions: Identify the correct spelling of the vocabulary word.

a) fonics b) phonics c) phonix

Word Parts

Directions: Place the different forms of the word *phonics* into the correct category or categories below. Use these forms: phonetic, phonics, X, and X.

Noun	Verb	Adjective	Adverb
phonics	X	phonetic	X

MEANING

Form-meaning connection

Directions: Choose the best definition for the word.

phonics a) something that is not real
 b) spellings related to sounds
 c) a thing used for talking to people far away

17. accelerate - (verb) to move or go faster; to increase speed.

Sample sentence: She accelerated the speed of her car to make sure that she would not have to stop for a red traffic light.

FORM

Spoken

ak SELL er ate

Written

Directions: Identify the correct spelling of the vocabulary word.

a) aksellerate b) accelerate c) axelerate

Word Parts

Directions: Place the different forms of the word *accelerate* into the correct category or categories below. Use these forms: accelerate, accelerating, acceleration, and X.

Noun	Verb	Adjective	Adverb
acceleration	accelerate	accelerating	X

MEANING

Form-meaning connection

Directions: Choose the best definition for the word.

accelerate

a) to do your best

b) to work for money

c) to increase speed

20. considerable - (adjective) large in size, distance, or extent; a lot.

Sample sentence: She is lucky to have a considerable amount of money.

FORM

Spoken

kun SID er a bull

Written

Directions: Identify the correct spelling of the vocabulary word.

a) considerable b) konsiderable c) cunsiterable

Word Parts

Directions: Place the different forms of the word *considerable* into the correct category or categories below. Use these forms: consider, considerable, considerably, and X.

Noun	Verb	Adjective	Adverb
X	consider	considerable	considerably

MEANING

Form-meaning connection

Directions: Choose the best definition for the word.

considerable

a) thinkable

b) large

c) in a chair

USE

Grammar

Directions: Choose the best ending to complete the sentence.

- | | |
|-------------------------------------|--|
| Animals that have large antlers, | a) can use them to fight. |
| He felt so much exasperation, | b) that he finally quit his job. |
| Because Billy is the teacher's pet, | c) the teacher is very nice to him. |
| During the consultation, | d) I received a lot of help. |
| His thinking style makes him | e) over analyze every book he reads. |
| His son is a mirror image of him, | f) he looks so much like him. |
| When you meet an obstacle, | g) go around it. |
| When children are in kindergarten, | h) they spend a lot of time playing. |
| His biggest accomplishment in life | i) was climbing Mount Everest. |
| Using a phonics system in school, | j) children can learn to read. |
| When it finally dawned on me, | k) I understood everything. |
| I could not identify the criminal | l) because I could not remember his face. |
| Your car may become stranded | m) if you drive it too far into the water. |
| I detest beef, | n) you cannot make me eat it. |
| To perceive the difference, | o) you have to look carefully. |
| She often sighs | p) when she feels sad. |
| You should accelerate your speed | q) you cannot drive slowly on this street. |
| When earthquakes occur | r) you should hide under a table. |
| Her initial answer | s) was yes, but then she changed it to no. |
| He gained considerable weight, | t) he should go on a diet. |

USE

Collocations

Directions: Match the vocabulary words from the text with the words often used with them.

- | | |
|--------------------|---------------|
| 1) Obstacle | a) large |
| 2) Pet | b) well-loved |
| 3) Sigh | c) deep |
| 4) Consultation | d) free |
| 5) Phonics | e) game |
| 6) Over analysis | f) constant |
| 7) Mirror image | g) reversed |
| 8) Exasperation | h) total |
| 9) Antler | i) hard |
| 10) Kindergarten | j) children's |
| 11) Accomplishment | k) great |
| 12) Dawn on | l) finally |
| 13) Identify | m) accurately |
| 14) Strand | n) alone |
| 15) Detest | o) strongly |
| 16) Perceive | p) clearly |
| 17) Accelerate | q) quickly |
| 18) Occur | r) suddenly |
| 19) Initial | s) reaction |
| 20) Considerable | t) amount |

Learning to Read

MEANING

Associations

Directions: Use the words from the list below to replace the words in the story that are in parentheses (). Use the words from the list only once.

Success	Horns	Fast	Large
Meeting	Understood	Hated	Irritation
Recognize	First	Preschool	Copy
Block	Happen	Overthinking	Aware
Favorite	Sounds	Breathe	Stuck

In first grade, I had the same teacher that my sister had four years before. Janet had been Mrs. Maniere's _____ (**pet**), and it did not take me long to understand that I had to work hard if I wanted her to like me too. Janet was a good reader and was ahead of her class in that subject. She had taught herself to read before she even started _____ (**kindergarten**). I, on the other hand, had not. When we began to study the alphabet seriously, the letters "b" and "d" became big _____ (**obstacles**) for me. I got them confused when they were written small. In class, when I was asked to _____ (**identify**) them, I got them wrong and felt bad. I began to fear that if I continued to make mistakes, Mrs. Maniere would never like me.

I began to spend a _____ (**considerable**) amount of time practicing the alphabet by myself. It was then that I began my life-long practice of thinking too much. The reason I was having trouble with "b"s and "d"s was that when they are written small, they are _____ (**mirror images**) of each other. I had already learned that things are

backwards in mirrors, and so I thought that a 'b' should really be a 'd,' and a 'd' should really be a 'b'. When I discovered that I was wrong, I no longer had any trouble _____ (**perceiving**) the difference between them.

I did, however, develop a new reading problem. I just could not finish our _____ (**initial**) reading book. Although I liked the story and the pictures in the book, "We Feed a Deer," that book was not my friend, and it made my life difficult. While other students moved on to the next book, and the ones after that, I still could not get all the way through my book without getting _____ (**stranded**). I fell behind the other students in my class, and I was put in the "slow" reading group.

Mrs. Maniere called my parents in for a _____ (**consultation**). She was beginning to worry that I would never learn to read and thought that maybe something was wrong with me. She talked about her fears and _____ (**exasperation**) with my parents. She wondered why I could read a word on one page, but when I saw it again on another, I could not read it. Did I have a problem with my head, with _____ (**phonics**), or with my eyes?

My sister started spending extra time with me at home, practicing. I understood that my reading problems were big if my sister, who _____ (**detested**) me, was willing to help. I worked with her, trying again and again to understand the rules of reading. Sometimes she was not very nice to me and would _____ (**sigh**) very loudly and roll her eyes when I made the same mistake for the 12th time.

I could have quit, I guess, but by then I really wanted to learn the secrets of the rules of reading. I continued to practice, to think about reading, and to try to understand the rules until it finally _____ (**dawned on**) me that the same word could be used twice. I had been unable to read all the way through my book because I stopped whenever I saw a word that looked the same as one I had already read. There were so many words, I thought, why would any of

them _____(**occur**) twice? I thought that when I saw the same word a second time, that it must really be a different word, and so I tried to guess what it could be and how to say it. _____(**Over analysis**) had again made trouble for me.

Once I made this discovery, I successfully finished "We Feed a Deer." I did not even slow down at the word _____("antlers.") I was then able to go on to the next book, "Here Come the Dogs." Now that I understood how it all worked, I _____(**accelerated**) through all the "baby" books and ended the school year reading a thick, more grown-up book in the top reading group.

I think now that my love of reading comes from the difficult time that I had learning how to do it. If I had been able to learn it as easily as my sister did, I probably would not have felt that it was an _____(**accomplishment**) at all. Learning to read was difficult for me, but because it was, I learned to love the secrets that only reading can tell me.

Appendix F**Control Group Essay Prompt****Write an Essay about Reading**

Write an essay about your own experiences when you learned how to read. Be sure to write about:

how old you were when you learned
the person or people who helped you learn
whether it was easy or difficult for you to learn
any kinds of problems you had while you were learning
what kinds of books you first read
how you feel about reading now
how you feel about reading English

Your essay should be 1 or 2 pages long. Please check your grammar and spelling and write as clearly as you can.

Appendix G

Immediate Vocabulary Posttest

Directions:

- a). For multiple choice questions, choose the best answer.
 b). For the other questions, write the correct vocabulary word in the blank. Please spell as carefully as you can.
 c). If you already knew a word so well that you could have answered the question correctly before today, please put a \checkmark in the box () next to the answer.

In first grade, I had the same teacher that my sister had four years before. Janet had been
¹
 Mrs. Maniere's **favorite** and it did not take me long to understand that I had to work hard if
 I wanted her to like me too. Janet was a good reader and was ahead of her class in that subject.
²
 She had taught herself to read before she even started **preschool**. I, on the other hand, had
 not. When we began to study the alphabet seriously, the letters "b" and "d" became big
³
blocks for me. I got them confused when they were written small. In class, when I was asked
⁴
 to **recognize** them, I got them wrong and felt badly. I began to fear that if I continued to make
 mistakes, Mrs. Maniere would never like me.

1. a. carriage
 b. flavor
 c. pet
 d. kettle

2. _____

3. a. toys
 b. abscesses
 c. cartoons
 d. obstacles

4. _____

⁵
 I began to spend a **large** amount of time practicing the alphabet by myself. It
 was then that I began my life-long practice of thinking too much. The reason I was having
 trouble with "b"s and "d"s, was that when they are written small, they are **copies** of each
⁶
 other. I had already learned that things are backwards in mirrors and so I thought that a 'b'
 should really be a 'd,' and a 'd' should really be a 'b'. When I discovered that I was wrong, I no

7

longer had any trouble **being aware of** the difference between them.

5. a. annual
 b. considerable
 c. continual
 d. financial

6. _____

7. a. wiping
 b. perpetuating
 c. orienting
 d. perceiving

8

I did, however, develop a new reading problem. I just could not finish our **first** reading book. Although I liked the story and the pictures in the book, "We Feed a Deer," that book was not my friend, and it made my life difficult. While other students moved on to the next book, and the ones after that, I still could not get all the way through my book without getting

9

stuck. I fell behind the other students in my class and I was put in the "slow" reading group.

8. _____

9. a. stranded
 b. bandaged
 c. handled
 d. flown

10

Mrs. Maniere called my parents in for a **meeting**. She was beginning to worry that I would never learn to read and thought that maybe something was wrong with me. She talked

11

about her fears and **irritation** with my parents. She wondered why I could read a word on

one page but when I saw it again on another, I could not read it. Did I have a problem with my

12

head, with **sounds**, or with my eyes?

10. _____

11. a. exasperation
 b. condolence
 c. penmanship
 d. caution

12. _____

My sister started spending extra time with me at home, practicing. I understood that my reading problems were big if my sister, who **hated** me, was willing to help. I worked with her, trying again and again to understand the rules of reading. Sometimes she was not very nice to me, and would **breathe** very loudly and roll her eyes when I made the same mistake for the 12th time.

13. a. knighted
 b. detested
 c. conjured
 d. calculated

14. _____

I could have quit, I guess, but by then I really wanted to learn the secrets of the rules of reading. I continued to practice, to think about reading, and to try to understand the rules, until it finally **became understood** that the same word could be used twice. I had been unable to read all the way through my book because I stopped whenever I saw a word that looked the same as one I had already read. There were so many words, I thought, why would any of them **happen** twice? I thought that when I saw the same word a second time, that it must really be a different word, and so I tried to guess what it could be and how to say it. **Over thinking** had again made trouble for me.

15. a. rattled about me
 b. picked on me
 c. dragged around me
 d. dawned on me

16. _____

17. a. over analysis
 b. high expense
 c. below average
 d. over protection

Once I made this discovery, I successfully finished "We Feed a Deer." I did not even slow down at the word "**horns.**" I was then able to go on to the next book, "Here Come the Dogs". Now that I understood how it all worked, I **moved fast** through all the "baby" books and ended the school year reading a thick, more grown-up book in the top reading group.

I think now that my love of reading comes from the difficult time that I had learning how to do it. If I had been able to learn it as easily as my sister did, I probably would not have
20
felt that it was a **success** at all. Learning to read was difficult for me, but because it was, I learned to love the secrets that only reading can tell me.

18. _____
19. a. tripled
b. countered
c. accelerated
d. encapsulated
20. _____

Appendix H

Delayed Vocabulary Posttest

Your Number _____

Learning to Read

Directions:

- a). For multiple choice questions, choose the best answer.
 b). For the other questions, write the correct vocabulary word in the blank. Please spell as carefully as you can.

In first grade, I had the same teacher that my sister had four years before. Janet had been
¹
 Mrs. Maniere's **favorite** and it did not take me long to understand that I had to work hard if
 I wanted her to like me too. Janet was a good reader and was ahead of her class in that subject.
²
 She had taught herself to read before she even started **preschool**. I, on the other hand, had
 not. When we began to study the alphabet seriously, the letters "b" and "d" became big
³
blocks for me. I got them confused when they were written small. In class, when I was asked
⁴
 to **recognize** them, I got them wrong and felt badly. I began to fear that if I continued to make
 mistakes, Mrs. Maniere would never like me.

1. a. carriage
 b. flavor
 c. pet
 d. kettle

2. _____

3. a. toys
 b. abscesses
 c. cartoons
 d. obstacles

4. _____

⁵

I began to spend a **large** amount of time practicing the alphabet by myself. It
 was then that I began my life-long practice of thinking too much. The reason I was having
 trouble with "b"s and "d"s, was that when they are written small, they are **copies** of each
⁶
 other. I had already learned that things are backwards in mirrors and so I thought that a 'b'
 should really be a 'd,' and a 'd' should really be a 'b'. When I discovered that I was wrong, I no

7

longer had any trouble **being aware of** the difference between them.

5. a. annual
b. considerable
c. continual
d. financial

6. _____

7. a. wiping
b. perpetuating
c. orienting
d. perceiving

8

I did, however, develop a new reading problem. I just could not finish our **first** reading book. Although I liked the story and the pictures in the book, "We Feed a Deer," that book was not my friend, and it made my life difficult. While other students moved on to the next book, and the ones after that, I still could not get all the way through my book without getting

9

stuck. I fell behind the other students in my class and I was put in the "slow" reading group.

8. _____

9. a. stranded
b. bandaged
c. handled
d. flown

10

Mrs. Maniere called my parents in for a **meeting**. She was beginning to worry that I would never learn to read and thought that maybe something was wrong with me. She talked

11

about her fears and **irritation** with my parents. She wondered why I could read a word on

one page but when I saw it again on another, I could not read it. Did I have a problem with my

12

head, with **sounds**, or with my eyes?

10. _____

11. a. exasperation
b. condolence
c. penmanship
d. caution

12. _____

My sister started spending extra time with me at home, practicing. I understood that my reading problems were big if my sister, who **hated** me, was willing to help. I worked with her, trying again and again to understand the rules of reading. Sometimes she was not very nice to me, and would **breathe** very loudly and roll her eyes when I made the same mistake for the 12th time.

13. a. knighted
b. detested
c. conjured
d. calculated

14. _____

I could have quit, I guess, but by then I really wanted to learn the secrets of the rules of reading. I continued to practice, to think about reading, and to try to understand the rules, until it finally **became understood** that the same word could be used twice. I had been unable to read all the way through my book because I stopped whenever I saw a word that looked the same as one I had already read. There were so many words, I thought, why would any of them **happen** twice? I thought that when I saw the same word a second time, that it must really be a different word, and so I tried to guess what it could be and how to say it. **Over thinking** had again made trouble for me.

15. a. rattled about me
b. picked on me
c. dragged around me
d. dawned on me

16. _____

17. a. over analysis
b. high expense
c. below average
d. over protection

Once I made this discovery, I successfully finished "We Feed a Deer." I did not even slow down at the word "**horns**." I was then able to go on to the next book, "Here Come the Dogs.". Now that I understood how it all worked, I **moved fast** through all the "baby" books and ended the school year reading a thick, more grown-up book in the top reading group.

I think now that my love of reading comes from the difficult time that I had learning how to do it. If I had been able to learn it as easily as my sister did, I probably would not have felt that it was a **20** **success** at all. Learning to read was difficult for me, but because it was, I learned to love the secrets that only reading can tell me.

18. _____

19. a. tripled
b. countered
c. accelerated
d. encapsulated

20. _____

Appendix I

Feedback Questionnaire

Your Number _____

Feedback

Please answer the following questions about the vocabulary learning exercises and tests that you completed.

Please circle the **ONE** word that best describes what you think.

1. I am good at learning English.

YES! yes maybe no NO!

2. I am good at learning vocabulary words.

YES! yes maybe no NO!

3. I think it is important to learn vocabulary.

YES! yes maybe no NO!

4. I think that learning vocabulary will help me to communicate better in English.

YES! yes maybe no NO!

5. The reading text (story) was easy for me to understand.

YES! yes maybe no NO!

6. Doing the exercises made me think about the words.

YES! yes maybe no NO!

7. Doing the exercises helped me learn and remember the new vocabulary words.

YES! yes maybe no NO!

8. I think this is a good way to study and learn vocabulary.

YES! yes maybe no NO!

9. I would like to learn more vocabulary words using this method.

YES! yes maybe no NO!

Please write your answers to the following questions.

1. What did you like most about learning vocabulary this way?

2. What did you not like about learning vocabulary this way?

3. Is there anything you would like to change about this method of learning vocabulary?

VITA

Jean Louise Ferguson

2213 Heritage Ave. #1
Garden City, KS 67846
jlf193@yahoo.com

Education	2009	Ph.D. Applied Linguistics The Pennsylvania State University, University Park, Pennsylvania
	1997	M.S. Educational Psychology The Pennsylvania State University, University Park, Pennsylvania
	1992	B.A. Psychology Wesleyan University, Middletown, Connecticut
	1990	A.S. Liberal Arts Tunxis Community College, Farmington, Connecticut
Teaching Experience	2003- Present	Instructor/Head, ESL Program Garden City Community College, Garden City, Kansas
	2000- 2001	Instructor, Intensive English Communication Program The Pennsylvania State University, Pennsylvania
	1999- 2000	Teaching Assistant, English as a Second Language Program The Pennsylvania State University
	1997- 1999	Teaching Assistant, Department of Speech Communication The Pennsylvania State University, Pennsylvania
	1992- 1993	English Teacher, ACC English School Anjo-Shi, Aichi-Ken, Japan
	Research Experience	1997- 1999
1995- 1997		Research Assistant to Peggy Van Meter, Educational Psychology The Pennsylvania State University, Pennsylvania
Presentations	2008	<i>Methods: Intervention & Remediation</i> , Equity & Access Discussion Panel, Kansas State University, Manhattan, Kansas
	2006	<i>Student Scrapbooks as Culminating Grammar Projects</i> , CoTesol Conference, Denver, Colorado
	2006	<i>Avoiding Derailment with ESL Students</i> , Kansas Academic Advising Network Conference, Washburn University, Topeka, Kansas
	2004	<i>Strategies for Including ESL Students in English Classes</i> , Fall English Workshop, Fort Hays State University, Fort Hays, Kansas