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# Review of Effects of Glosses on Incidental Vocabulary Learning and Reading Comprehension

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## *Abstract*

Vocabulary learning is an essential part of language learning. Hunt and Beglar (1998) suggested three approaches to enhance vocabulary learning—incidental learning, explicit instruction, and independent strategy development, among which incidental vocabulary learning was regarded as an essential part of L2 vocabulary acquisition. In addition, many studies have confirmed that glosses are very useful for incidental vocabulary learning and reading comprehension. The present paper reviews the recent results of the research on incidental vocabulary acquisition and reading comprehension. The implications of the researches, the limitations of the studies and the directions for future research were discussed.

*Key words: glosses; incidental vocabulary learning; reading comprehension*

## 1. Introduction

Vocabulary learning is an essential part of language learning. Learning words can be considered to be the most important aspect of second language (L2) learning (Knight, 1994). Candlin (1988, Pvii) said, "... the study of vocabulary is at the heart of language teaching in terms of organization of syllabuses, the evaluation of learner performance, and the provision of learning resources ..."

Hunt and Beglar (1998) concluded three approaches to enhance vocabulary learning—incidental learning, explicit instruction, and independent strategy development. Among them, incidental vocabulary learning was regarded as an integral part of L2 vocabulary learning.

Second language learning researchers (Hulstijn & Laufer, 2001; Krashen, 1989;

Wesche & Paribakht, 1999) generally think that vocabulary growth often appears incidentally while learners are doing other cognitive exercises. Among these cognitive activities, reading, especially extensive reading, has aroused much research attention because of the fact that pleasure reading habits can enlarge first language (L1) learners' vocabulary, and promote their language competence and academic performances (Nation, 2001). In addition, children can acquire L1 vocabulary through reading within a short period of time by incidental vocabulary learning.

Researchers have suggested some ways to promote vocabulary gains in incidental vocabulary learning: the use of dictionary, guessing from context, glosses, and so on.

Many studies have confirmed that glosses are very useful for reading comprehension (Davis, 1989; Jacobs, 1994; Johnson, 1982; Myong Hee Ko, 2005) and incidental vocabulary learning (Chen, 2002; Duan & Yan, 2004; Gettys et al., 2001; Grace, 1998, 2000; Hulstijn, Hollander and Greidanus, 1996; Jacobs et al., 1994; Kost et al., 1999; Lü et al., 2005; Miyasako, 2002). With the development of computer and multimedia technology, gloss formats are not limited in text only. This technologically advanced tool offers different modalities of gloss, i.e., pictures, animations, video, sound, etc., which cause immediate access, reader control and absence of interruption in reading (Al-Seghayer, 2003).

## **2. Incidental Vocabulary Learning**

### **2.1 The Definitions of Incidental Vocabulary Learning**

What does “incidental learning” really mean? There are not always agreed-upon or overtly stated definitions of it (Gass, 1999).

Most of the papers in the special issue of incidental vocabulary learning (Wesche & Paribakht, 1999) have taken incidental learning as something that is learned without specific focus of attention in a classroom context. In Wesche and Paribakht's definition (1999), incidental vocabulary learning refers to the process in which learners focus on comprehending meaning of reading and listening contexts rather than on the intentional vocabulary learning and acquire vocabulary as a “by-product” without the learner's conscious decision, or intention to learn the words. Nation (2001) has shown that in incidental vocabulary learning the learners' attention is focused on some other feature, usually the message that is conveyed by a speaker or a writer. If the amount of unknown vocabulary is low in such messages, considerable vocabulary learning can occur even though the learners' attention is not directed toward vocabulary learning.

Another different interpretation of the incidental learning was put by Haynes (1998, cited by Wesche & Paribakht, 1999). She saw attention rather than intention as the key to clarifying the construct, as well as a separation of teaching considerations from those of learning. She proposed two continua, one of them from “indirect teaching” to “direct teaching” and the other from “incidental learning” (or automated learning, involving the learner's peripheral attention while focal attention is elsewhere) to “attended learning” (involving focal attention).

## 2.2 The Relationship between Reading and Incidental Vocabulary Learning

Nation (2001: 232) stressed the importance of incidental learning through “message-focused activities” as follows: “A well-balanced language learning program has an appropriate balance of opportunities to learn from message-focused activities and from direct study of language items, with direct study of language items occupying no more than 25% of the total learning program.” Huckin and Coady (1999: 182) indicated that “except for the first few thousand most common words, vocabulary learning dominantly occurs through extensive reading, with the learner guessing at the meaning of unknown words”.

In the process of incidental vocabulary learning, word knowledge is thought to be cumulated and developed gradually through multiple exposures in various reading contexts. Extensive reading, as a form of comprehensible input, has the effect of providing learners with rich contexts ideal for vocabulary learning. During the reciprocal process of extensive reading, the acquisition of words is the result of successes in inferring word meanings from a meaningful context and through more reading experiences the developed and matured vocabulary inference ability could in turn contribute to reading level.

For L2 learning, extensive reading is considered beneficial for overall language competence (Krashen, 1993) and fundamental to vocabulary development as well. Researchers such as Krashen believe that similar to L1 word learning, reading is the major means for acquiring vocabulary and have thus strongly encouraged the implementation of extensive reading programs in an L2 learning environment (Krashen, 1989). The proposition that most vocabulary is learned incidentally has appealed to the default argument that learning from context is the only way to account for most vocabulary acquisition (Wesche & Paribakht, 1999).

Nagy and Anderson (1984, cited by Nation & Coady, 1988: 101) concluded that “even the most ruthlessly systematic direct vocabulary instruction could neither account for a significant proportion of all the words children actually learn, nor cover more than a modest proportion of the words they will encounter in school reading materials”.

The results of many empirical studies support the assumption of the important relationship between incidental vocabulary learning and extensive reading. Milton and Meara (1995, cited by Nagy, 1997) estimated that advanced students could learn words at an annual rate close to 2,500 in a second language setting. A substantial proportion of this growth is possibly from incidental learning. Elley’s (1991) survey of “book flood” studies (the essential element of such studies is increasing the availability of books to the students) showed that L2 learners tended to benefit more from an increase in volume of reading than do L1 learners because they encountered unfamiliar words at a greater rate than L1 learners. The study suggested that language learning was for the most part incidental, and it relied on intrinsic motivation, primarily through the use of interesting, well-illustrated books.

Replicating the famous experiment by Saragi, Nation and Meister in 1978, Horst, Cobb and Meara (1998) designed a carefully controlled book-length reading treatment (34 low-intermediate learners in Oman read 21,232 words of the simplified *Mayor of Casterbridge* text in a ten-day period). The result showed that there was an average

pick-up of about one in every five new words and subjects with larger L2 vocabulary sizes had greater incidental word learning gains. The study also found that L2 learners recognized the meaning of new words and built associations between them as a result of comprehension-focused extensive reading.

The results of Day et al. (1991) demonstrated that exposure to previously unknown or difficult words through sustained silent reading for entertainment by Japanese EFL students had a positive effect on their ability to recognize these words in a vocabulary test.

### **2.3 Problems with Incidental Vocabulary Learning**

Although extensive reading has an influence on incidental vocabulary learning, studies (Huckin & Coady, 1999; Hulstijn, 1993; Wesche & Paribakht, 2000) have found that reading for L2 vocabulary development may lead to some problems. First, wrong inferences, superficial vocabulary learning, which prevents learners from using words actively. Some lexical items, such as words with a deceptive morphological structure, idioms, words with multiple meanings, false cognates and synforms (morphologically or phonologically similar words) (Laufer, 1997) often misguide the learners and make them misunderstand the words. It short-circuits readers' contextual guessing process.

Second, guessing is effective only when the context is well understood and almost all of the surrounding words in the text are known, which requires good textual clues and substantial prior vocabulary knowledge on the part of the learner. Unlike native speakers, L2 learners have some difficulties in guessing word meanings correctly, for they always have more opportunities to encounter new words within various contexts with their lack of sufficient word knowledge. Moreover, correct guessing of word meanings depends on accurate recognition of surrounding words and good use of reading strategies (Huckin & Coady, 1999). However, learners always feel frustrated in comprehension when facing overwhelming texts in extensive reading, for their word knowledge is insufficient and lack active use of different reading strategies (Grabe & Stoller, 1997). So the readers may decide to ignore the words, or can not infer a word from context (Huckin & Coady, 1999).

Last, the non-recurrence of new words (i.e., a single encounter of words) can not guarantee the acquisition of the vocabulary (Huckin & Coady, 1999). This can be accounted for by the fact that unlike native speakers, L2 learners have very few opportunities to be exposed to the unknown words repeatedly, apart from the high-frequency words. As a result, they can not pick up the features of the words incrementally to form the solid lexical knowledge in their mental lexicon.

### **2.4 Ways to Enhance Incidental Vocabulary Learning**

How, then, can these disadvantages to incidental vocabulary retention be overcome? Researchers have suggested some ways to solving the problems and promoting vocabulary acquisition in incidental vocabulary learning.

First, the research showed that besides incidental vocabulary learning from reading context, oral context also plays an important role in incidental vocabulary learning. The first several thousand word families in a language cover the most of the words in oral interaction and roughly 84% of words in written texts tend to be learned first in

naturalistic oral context (Wesche & Paribakht, 1999).

Second, the use of dictionary can also promote incidental vocabulary learning. The study of Luppescu and Day (1993) showed that during reading the students who used a dictionary scored significantly better than the students who did not use a dictionary in a vocabulary test. Grabe and Stoller (1997) did a successful case study of learning by a highly motivated learner, who used the bilingual dictionary to study vocabulary both intentionally as well as incidentally.

Other approaches that can be used to help learners enhance the incidental vocabulary learning include doing some context-based exercises, learning some guessing strategies, using marginal glosses, etc.

A gloss is a translation or brief explanation of difficult or technical text (e.g. unusual words) (Segler, 2001). It is the easiest way to understand the meanings of words as they appear in context, since it does not even demand the effort of searching and then choosing the appropriate meaning out of several possible ones, which is required by dictionary look-up. Researchers generally agree that glosses facilitate reading comprehension and short-term vocabulary retention (Kost et al., 1999).

### 3. Glosses

Researchers generally agree that the use of vocabulary glosses in L2 reading materials is a common practice and glosses facilitate reading comprehension and vocabulary learning in both printed materials and electronic materials.

#### 3.1 Meanings and Functions of Glosses

The concept of glossing can be traced to the Middle Ages. It has not been largely studied by researchers until late in last century. Traditionally, a gloss is a definition or meaning for L2 learners to promote reading comprehension. Nation (1983) defined glosses as short definitions. Segler (2001) referred to them as translations or brief explanations of difficult or technical texts (e.g. unusual words) and categorized glosses into textual glosses, pictorial (visual) and aural glosses and various combinations. Roby (1999: 96) stated that “glosses are many kinds of attempts to supply what is perceived to be deficient in a reader’s procedural or declarative knowledge”. Lomicka (1998: 41) gave the definition more concretely “typically located in the side or bottom margins, glosses are most often supplied for ‘unfamiliar’ words, which may help to limit continual dictionary consultation that may hinder and interrupt the L2 reading comprehension process”.

Myong Hee Ko (2005) concluded four advantages (awkward English) from glossing. First, glosses can help readers know new words more accurately rather than guess the words wrongly. Guessing meaning of the words from context can be difficult and risky because of readers’ lack of language or reading strategies. Second, glosses can help readers not be interrupted while they are reading. Since glosses provide meanings for the new words, L2 readers needn’t look them up constantly. Third, glosses can help readers connect prior knowledge with new knowledge in the text, which can help them understand and

remember the content of the text. Fourth, glosses can allow readers for greater autonomy. They can look up the words they do not know.

Nagata (1999) summarized the four functions of glosses on vocabulary learning: (1) Marginal glosses are easier to use than a dictionary; (2) They draw learner's attention to target words, supporting the notion of "consciousness-raising" and "input enhancement"; (3) They help to connect words to meanings immediately, contributing to the "meaning-form connection" approach; (4) They encourage learners to perform lexical processing, which may contribute to the retention of the words.

### **3.2 Previous Studies on Glosses**

Earlier literatures on glossing aroused a controversial debate whether glosses enhance L2 reading comprehension or hinder L2 reading comprehension and findings were inconsistent. Jacobs, Dufon and Fong (1994) took an experiment with intermediate students who studied Spanish as SL and found that glossing did not significantly make students recall more of the text, but higher level students showed higher recall when they used glosses. On the other hand, the studies by Davis (1989), Jacobs (1994), and Hulstijn, Hollander and Greidanus (1996) showed the use of glosses could give a help in L2 reading.

Although there is a controversial debate on glossing in recent literature, glossing is still a common and acceptable aid for many foreign language text books (Davis, 1989). It is the easiest way to understand the meanings of words as they appear in context and to help a learner understand reading materials, since glosses are often in the margin on the same page or on another page and learners need not look up the words in a dictionary.

In the previous studies of glosses, some researchers examined the effects of glosses on reading comprehension, others explored the effects on vocabulary learning, and still others enquired the effects on both reading comprehension and vocabulary learning. We will review these studies in turn below.

#### **3.2.1 The Effects of Glosses on Reading Comprehension**

Some researchers discussed whether glosses could improve comprehension of a text. Davis (1989) examined whether marginal glosses would promote comprehension of a text. Seventy-one U.S. students in a French class were divided into three groups and read a short passage under three text conditions. In the first group, the subjects were required to read the passage for fifteen minutes, wrote what they could remember for ten minutes, and then reread the passage for five minutes. In the second condition the subjects were offered a vocabulary guide before reading, and then were guided by some questions and notes on the story and given meanings of some new vocabulary. They studied the questions and notes for ten minutes, read for fifteen minutes, and then wrote. In the third condition the subjects were given the same questions and meanings of the same vocabulary in glossed form. The subjects read the text for twenty-five minutes, and then wrote. The result showed that those who read a text with glossing performed significantly better than those who read a text without glossing. The study showed that marginal glosses could promote comprehension of a text. Jacobs' (1994) study also showed a positive effect of glosses on foreign language reading comprehension. One hundred and sixty-six U.S.



students learning Spanish were randomly divided into two groups according to two types of Spanish reading texts—no gloss and with English (L1) glossing. Subjects were asked to read the text and write what they could recall of the content of the story in their L1. The results showed that the glossed group did significantly better than the group without glosses.

Other researchers compared the effect of vocabulary treated under different conditions on reading comprehension. Johnson (1982) treated vocabulary under four different conditions on reading comprehension: (1) no help with vocabulary; (2) studying the definitions of words before reading; (3) reading a passage with the target words glossed; (4) studying the target words before reading and reading the text with glosses. After reading the passage, seventy-two advanced ESL university students were demanded to do a cloze test, recall the story in their L2 and recognize exact sentences from the passage. The results indicated that background knowledge of reading passage facilitated reading comprehension, but exposure to the different types of vocabulary conditions did not significantly affect the comprehension.

Others studied which gloss type was the best to enhance reading comprehension. Myong Hee Ko (2005), for instance, provided further study on the effect of glossing on L2 reading comprehension. In her study, a non-gloss condition was compared with a gloss condition, so was L1 glosses with L2 glosses conditions. One hundred and six subjects were undergraduates at a university in Korea. Twelve were demanded to think aloud, and the other ninety-four took part in the main study. In the main study the subjects were divided into three groups according to three conditions: no gloss, Korean (L1) gloss and English (L2) gloss. They were asked to read the material and take a multiple-choice reading comprehension test and answered a questionnaire. The results indicated that only L2 gloss group outperformed the other two groups in reading comprehension. However, the think-aloud protocols revealed that both L1 and L2 gloss groups read faster and comprehended better than no gloss group. That is to say, L1 glosses also enabled them to comprehend more easily while reading, although there was no statistics to show there was a significant difference between no gloss and L1 gloss. In questionnaires, the subjects showed their preference for L2 glosses.

### **3.2.2 The Effects of Glosses on Vocabulary Learning**

Many studies have confirmed that a gloss is more useful than no gloss for incidental vocabulary learning. Hulstijn, Hollander and Greidanus (1996) have examined the effectiveness of glosses on incidental vocabulary learning. They studied the influence of marginal glosses, dictionary use, and the reoccurrence of unknown words on incidental vocabulary learning. Dutch students who learned French as L2 read a short text that had been slightly adapted under one of three conditions: marginal glosses (L1), bilingual dictionary use, text-only (no glosses and no use of dictionary). They found that marginal glosses (L1) were more effective than bilingual dictionary use or a text-only condition.

Recently, researchers have become interested in which gloss type is more effective, and whether there are any differences between different glosses, for example, between single glosses and multiple-choice glosses (Duan & Yan, 2004; Miyasako, 2002). Miyasako

(2002) compared multiple-choice glosses and single glosses and found there was no difference between the multiple-choice and single glosses in their effect on vocabulary learning. Duan & Yan (2004) also examined the effects of multiple-choice glosses, single glosses and no glosses. The results indicated that both multiple-choice glosses and single glosses significantly promoted incidental vocabulary learning, while multiple-choice glosses were better than single glosses in incidental vocabulary learning.

Others studied the effects of sentence-level L1 translations on incidental vocabulary learning. Grace (1998, 2000) tested the effects of sentence-level L1 translations on incidental vocabulary learning, while Gettys et al. (2001) compared the glosses of sentence-level L1 translation with the glosses of dictionary form L1. Grace used sentence-level L1 translations to replace word definitions or explanations and found that the translation glosses were very effective, while Gettys et al. found that the dictionary form glosses were more effective than sentence-level translation glosses.

Some others compared the effects of L1 glosses with L2 glosses on incidental vocabulary learning (Chen, 2002; Lü et al., 2005; Jacobs et al., 1994; Miyasako, 2002). Jacobs et al. (1994) compared L1 with L2 glosses with eighty-five English-speaking subjects studying Spanish as a second language. They read a Spanish text under three conditions: (1) L1 (English) gloss; (2) L2 (Spanish) gloss; and (3) No gloss. After reading the text, they received two vocabulary tests: one immediately after the reading and the other four weeks later. The results showed that there was no significant difference between L1 and L2 glosses. Chen (2002) studied L1 and L2 glosses with eighty-five college freshmen as subjects who were studying English as a second language in Taiwan. The subjects were assigned to three groups: (1) L1 (Chinese) gloss; (2) L2 (English) gloss; and (3) no gloss. They were required to read a 193-word English text with 20 target words glossed. The results indicated that the L2 group performed better than the no gloss group, and there was no significant difference between L1 and L2 glosses. The results of Miyasako's study (2002) showed that the L2 gloss groups performed significantly better than the L1 gloss groups for the immediate test. Lü et al. (2005) compared the effects of Chinese glosses with English glosses. They divided the subjects into two groups: one was English gloss group; the other was Chinese gloss group. Each group included 25 subjects, involving higher level and lower level subjects. They read the same English articles, in which the gloss types were different. After the treatment, they were required to take an immediate vocabulary test and a delayed test two weeks later. The results showed that in the immediate test Chinese gloss group obviously performed better than English gloss group, especially the lower level subjects in Chinese gloss group, whereas in the delayed test the lower level subjects in Chinese gloss group outperformed those in English gloss group.

Studies have also examined the effects of other gloss types on incidental L2 vocabulary learning (Miyasako, 2002; Kost, et al., 1999). Kost, Foss, & Lenzini (1999) compared the three gloss types: (1) text-only (L1) gloss; (2) picture-only gloss; and (3) text (L1)-plus-picture. The subjects were fifty-six American university students who were studying German as a second language. They read a 272-word printed text containing 20 glossed words under three treatment groups with different gloss types. The subjects took two vocabulary tests on 14 target words. First test was taken immediately after reading and



the second one was taken two weeks later. The tests included multiple-choice of definitions and supply definitions. The results indicated that the text and picture glosses were better than the picture only or text only glosses.

In Miyasako's study (2002), there were six groups of gloss: (1) L2 (English) multiple-choice gloss; (2) L1 (Japanese) multiple-choice gloss; (3) L2 (English) single gloss; (4) L1 (Japanese) single gloss; (5) No gloss; and (6) Control (no reading). The subjects were 187 Japanese high school students. They were asked to read a 504-word text with 20 target words. The subjects took two vocabulary tests, one immediately after reading and the other 18 days later. The form of tests was multiple-choice questions. Subjects were required to see each target word in context and find the most appropriate one whose definition was written in English from four choices. The results showed that the L2 gloss groups (multiple-choice or single) performed significantly better than the L1 gloss groups (multiple-choice or single) for the immediate test. However, there was no difference between the multiple-choice and single gloss types in their effects on vocabulary learning.

Some researchers examined the effects of glosses on both reading comprehension and vocabulary learning. Jacobs et al. (1994) compared the three different gloss types on foreign language reading comprehension and foreign language vocabulary learning. The subjects were 85 native speakers of English who were studying Spanish as a second language. They were assigned to one of three different gloss conditions: no gloss, English (L1) gloss, and Spanish (L2) gloss. They were required to recall the story after reading the text written in Spanish with 32 words or phrases glossed. The subjects took two vocabulary tests unexpectedly: one was immediate test; the other was delayed test held four weeks later. The results of the immediate test indicated that both L1 and L2 glosses were better than no gloss; however, there was not any significant difference between L1 and L2 glosses. The questionnaire revealed that the subjects liked L2 glosses better than L1 glosses.

In addition to the above-mentioned studies, there are a few cases that have examined the effects of glossing with computerized materials.

### **3.3 Multimedia Environment**

With the integration of computer and multimedia technology into the field of language learning, a new study, Computer-Assisted Language Learning (CALL) emerged. Although the approach CALL is young, computer technology has been involved in promoting the process of language learning due to the fact that it is capable of carrying out more tasks than simply text processors. Many language educators even use many features of it to enhance vocabulary development and reading comprehension.

#### **3.3.1 Multimedia and Language Learning**

"Multimedia usually refers to many of the same ideas associated with hypermedia, but hypermedia might only make use of two types of media (e.g. text + sound or text + photographs). Multimedia tends to feature several media types including text, images, sound, video and/or animations" (Beatty, 2005: 39).

Researchers (Beatty, 2005; Hoogeveen, 1995) listed some advantages for the

applications of multimedia to language learning. First, a computer can be useful in promoting interest and readers who enjoy reading tend to read more and are more motivated and comfortable to read.

Second, multimedia can promote autonomous language learning. Learners who can take advantage of multimedia links to explore explanations and peripheral information can somewhat depend less on the teacher-centered classroom. A well-formed multimedia database of materials can also assist those young and second language learners who lack dictionary and library search skill.

Third, it can transmit information quickly and effectively to all students and keep them interested in learning. Multimedia presentations keep students alert and concentrated. It permits the incorporation of animation, pictures and sound into lessons, which encourage students to interact with the subject matter. Pictures and animations help inspire scientific principles, and multimedia makes students to take a more active role in learning.

Fourth, learners give response to multimedia in a complex way and give the feeling of experiencing information instead of simply acquiring it.

Last, computer-based multimedia helps students to develop technical and research skills that they cannot get from reading a textbook.

Since multimedia environment enables a quicker and more convenient access of the meanings, as well as other visual and interactive advantages, teachers can teach foreign language texts in a more amusing and efficient way by using this technology. Moreover, teachers can use many different formats and modes to teach the subject matter of a lesson and present information.

Multimedia also brings the benefits for vocabulary learning and some researchers developed computer-assisted vocabulary-skill-building software. Chanier and Selva (1998) emphasized the benefits of multimedia for learning L2/FL vocabulary and presented ALEXIA, a lexical learning environment for French as a L2. After concluding various viewpoints about the effectiveness of multimedia for vocabulary learning, they suggested useful criteria for assessing the quality of a visual representation in a lexical environment. Groot (2000) demonstrated another multimedia-enhanced computer-assisted word learning program, called CAVOCA, whose aim was to speed up the vocabulary acquisition process. CAVOCA is an interactive program leading learners through different stages of vocabulary development: deduction, consolidation and long-term retention. Similarly, Tozcu and Coady (2004) took a case study that compared the outcomes in vocabulary learning when using texts in a computer assisted courseware versus when using traditional materials. The aim was to find whether there were any different effects between direct vocabulary learning via computer assisted learning and traditional vocabulary training via print texts. Fifty-six subjects were intermediate level students coming from various L1 backgrounds. They were studying English for university academic preparation. The results suggested that the group, who used a computer assisted courseware, performed better than the group who used traditional materials in vocabulary learning. These results indicated positive effects of computer technology on vocabulary learning.

### 3.3.2 Multimedia Glosses

The multimedia glossary then has become a new way to enhance vocabulary development and reading comprehension. This technologically advanced tool offers features that are not attained through any other conventional instructional medium, such as offering different modalities, i.e., pictures, animations, video, sound, immediate access, reader control and absence of interruption (Al-Seghayer, 2003). Considering the factor of multimedia, Segler (2001) divided the forms of glosses into textual, pictorial (visual) and aural glosses, and various combinations thereof.

Researchers have investigated the effectiveness of multi-mode gloss types, such as printed text, still picture, dynamic video, and sound, which could enhance reading comprehension (Chun & Plass, 1996; Lomicka, 1998) and incidental vocabulary learning (Al-Seghayer, 2001; Chun & Plass, 1996; Nagata, 1999; Plass et al. 1998; Yeh & Wang, 2003; Yoshii & Flaitz, 2002; Yoshii, 2006).

There were studies that discussed the effects of multimedia glosses on reading comprehension. In Lomicka's (1998) research, the subjects, who were L2 university students enrolled in a French course, were asked to think aloud during the reading of text. The subjects read the text under one of three conditions: full glossing, limited glossing, or no glossing. The results showed that the condition with full glossing could promote reading comprehension. In Alessi and Dwyer's (2008) research, seventy-six US intermediate learners of Spanish read a Spanish newspaper article with four different conditions: one group of learners received the prereading activity (practice on the key vocabulary in the article), a second group received during-reading assistance (contextualized L1 translation in the form of hypertext glossing), a third group received both, and a fourth group (a control) received neither form of assistance. The study found that reading comprehension was significantly better for students receiving vocabulary assistance during reading, but not for those receiving it before reading.

More researches studied the effects of multimedia glosses on vocabulary learning. Plass et al. (1998) confirmed that multi-mode glosses were better than single-mode glosses. The study also tested the effects of gloss types in a multimedia environment. It studied whether both verbal (textual) and visual (picture) glosses helped learners more when they learned target words than one mode or none glosses. The subjects were one hundred and three American university students studying German as a second language. They read the same text on computer used in Chun & Plass (1996). The text included 24 target words. All the subjects read the text under the same condition: 12 target words with text and picture glosses, and the other 12 target words with text and video glosses. All the text was provided in L1. The vocabulary posttest demanded the learners to supply L1 translation for each target word. The results also showed that text and picture glosses were better than text and video glosses for learning the words incidentally.

Nagata (1999) conducted an experiment which was basically a computerized version of Watanabe's (1997) study. She compared the effectiveness of a single gloss and a multiple-choice gloss as American college students taking the second semester Japanese course read a text on the computer. She found that the multiple-choice gloss was significantly more effective than the single gloss.

Al-Seghayer (2001) compared text and picture glosses with text and video glosses. The subjects were thirty students studying English as a Second Language. They were required to read a text with 21 target words. The target words were divided into three groups: seven words with text only gloss, seven words with text and video gloss, and seven words with text and picture gloss; the text was written in L2 (English). The students took the immediate vocabulary tests. The results showed that the combination of text and video was more effective than that of text and picture.

Yoshii & Flaitz (2002) studied the three gloss types which Kost et al. (1999) had previously examined, but the difference was that they researched in a computer reading environment. One hundred and fifty-one students studying English as second language were subjects. They read a text with 20 word glosses, among which there were 14 target words. The subjects were assigned to three groups according to three gloss type groups: (1) text (L2) only; (2) picture only and (3) text (L2) and picture. After reading they were asked to do both the immediate and delayed vocabulary tests unexpectedly. The results confirmed that text and picture glosses were better than text only and picture only glosses.

Yeh & Wang's study (2003) on multimedia glosses was different from others' in two ways: first, in the study sound was used as a component of multimedia glosses; secondly, both L1 and L2 were used in textual glosses. The subjects were eighty-two university students in Taiwan. The study examined three gloss types: (1) text only; (2) text plus picture; and (3) text, picture and sound. The text included both L1 (Chinese translation) and L2 (English explanation). The results showed that the combination of text and picture was the most effective type among the three types.

Yoshii's study (2006) further discussed the three questions: 1) Do L1 and L2 glosses differ in their effectiveness on incidental vocabulary learning? 2) Do picture glosses (text-plus-picture) and no picture glosses (text-only) differ in their effectiveness on incidental vocabulary learning? 3) Are there any interaction effects among the three factors: languages (L1 or L2), pictures (presence or absence), and tests (immediate and delayed)? The results are: 1) Neither the definition-supply nor the recognition tests revealed significant differences between L1 and L2 glosses; 2) The definition-supply tests implied significant difference between picture glosses (text-plus-picture) and no picture glosses (text-only), but the recognition tests did not; 3) There were interaction effects between languages and tests for both the definition-supply and recognition tests.

Chun and Plass (1996) and Yanguas (2009) explored the effects of multimedia glosses on both vocabulary learning and reading comprehension. Chun and Plass employed a within-subjects design. The subjects, students in their second year of German, read text on the computer under the same condition: some words glossed with text only, some with text and pictures, and some with text and video clips, then they took a vocabulary test and a recall test. The results of this study showed that the combination of text and picture glosses was more effective than text only or text and video clips glosses in recalling new words. Moreover, visual multimedia also facilitated reading comprehension. In Yanguas' study, ninety-four participants read a computerized text under one of four gloss conditions: textual, pictorial, textual + pictorial, and no gloss (control). Reading comprehension, recognition, and production measures were utilized in a pre-post test

design. Results of analyses of the data gathered showed that all multimedia gloss groups noticed and recognized significantly more of the target words than the control group; no significant differences were found among any of the groups in production of the target vocabulary items; the combination gloss group significantly outperformed all other groups in reading comprehension.

#### 4. Pedagogical Implications of the Studies

The studies above show that glosses are useful for facilitating learners' incidental vocabulary learning either in text only or text plus picture, and students may utilize glosses in reading materials. When learners are reading, their attention to new words is attracted by the gloss and their knowledge of the unknown words is enriched by the rich context in the reading material. In addition, the presence of gloss can reduce students' burden of dictionary consultation, avoid the interruption of reading process and prevent learners from making wrong inference for the unknown words in the particular context. Thus, gloss can not only ensure learners' exact understanding of the text but also help learners know the meaning of the new words.

Using glosses in vocabulary teaching and learning, instructors, program developers and designers may consider the following factors. First, if learners are used to traditional glosses and do not know how other gloss types foster vocabulary learning, instructors need to spend some time training learners to use software in the most beneficial way and explain the efficacy of multimedia glosses to the learners in order to make sure that they can consult all informational categories available. Instructors and program developers can also produce some interesting reading materials and some vivid gloss types in order to increase learners' interests in learning the unknown words and learners can be encouraged to use different gloss types in reading.

Second, the criteria for selecting the words to be glossed need to be considered. Designers should avoid selecting too many words and selecting words based on their intuitive sense or personal judgment. Instead, they may base the selection on the available word lists and frequency corpora and gloss the words according to their usefulness and importance in the text. On the other hand, the learners can be asked to read the selected text and highlight all words that they do not know, which can be used as a criterion in glossing.

Third, the consideration should also be given to the proficiency levels of learners. The glosses need to be tailored to learner proficiency levels and must be compatible with their abilities. The glosses should also be clear and fit the context of the text in which the target words appear. Furthermore, the vocabulary assessment exercises should not only remain matching items, filling blanks, etc., but also provide opportunities to use the newly introduced vocabulary into new situations.

Fourth, many readers prefer to read on paper rather than read on computer or on line, which prevents hypertext gloss support. They will be willing to read computerized texts (rather than print them) only if they get additional benefits not available with the

print materials. This will require teachers and designers of instructional materials to develop more intelligent multi-media programming that present glosses that are truly interesting and helpful to readers.

Last, hypertext glosses can be colored or underlined if learners are encouraged to select them frequently, but this visibility may affect reading speed or comprehension. On the other hand, these glosses can also be invisible in the sense that they are not colored or underlined differently than the rest of the text. If learners really need to know the meaning of a word or phrase, they can point the mouse cursor at it and it changes from the ordinary pointing arrow to a pointing hand, and they then click with the mouse on the word or phrase and see in the upper-right or lower-right corner of the screen the gloss of the word or phrase. In this case, the reading speed and comprehension are not hampered.

## 5. Conclusions

### 5.1 Limitations of the Studies

Although there are a lot of studies mentioned above on the effects of glosses on vocabulary learning, there are certain concerns: 1) the studies have only scratched the surface of research involving multimedia glosses (Lomicka, 1998). Moreover, in our country there was not much study of this type, especially the study about the effect of multimedia glosses on incidental vocabulary learning. It is necessary to explore it further. 2) There are big differences between the similar studies, and no conclusive results. For example, the two studies of Chen (2002) and Jacobs et al. (1994) showed there were no differences between L1 and L2 in vocabulary learning, while Lü et al. (2005) found in their study that in word definition supply L1 glosses were better than L2 glosses in vocabulary learning, especially to lower level learners. Therefore, it is necessary to study further which language is more effective on incidental vocabulary learning. 3) Though Yoshii (2006) compared the effectiveness of L1 and L2 glosses, and investigated the effectiveness of visual cues, there are some problems: (1) He did not consider the factor of the subjects' English levels. (2) The target words were all verbs. (3) Instruments were not adequate enough: in definition-supply test (the subjects supplied the meaning of the target words in L1 [Japanese]) and recognition test (the subjects selected the most appropriate definition of a given word from four choices written in L2 [English]), the acquisition and retention of words were not tested in the context. Furthermore, in recognition test, multiple choices may lead to guessing the meaning of word, and the test effectiveness would be affected to some degree (Waring & Takaki, 2003).

Since the results of the comparisons between L1 and L2 are still inconclusive, it is necessary to further study L1 and L2 glosses and examine which gloss type is more effective. Although the previous studies have found some effects of glosses on incidental vocabulary learning, there exist some weaknesses and more research is needed on this issue.



## 5.2 Directions for Future Research

The future study will attempt to deal with these issues. That is to say, when we study glosses on incidental vocabulary learning, we should include languages, pictures, gloss types, the subjects' English levels and tests (immediate and delayed). We need to study whether L2 glosses help more the higher level learners and L1 glosses help more the lower level learners in acquiring words, and which language glosses help more intermediate learners. It is necessary to study whether the effect of the other pictorial cues combined with L1 or L2 glosses would be different because of different English level learners. We may investigate the effects of language or pictorial cues glosses on other types of words including abstract words in future. We also need to investigate glosses and explore when or in what conditions what glosses benefits which learners. That is to say, we should consider different intrapersonal effects based on learning style preferences. The longer-term effect of glosses also needs to be looked into; the notion of "long term" effect itself could be a topic of study; time of delayed tests can be set in more than two weeks.

With the development of multimedia technology, different media types can be used in language teaching and learning. The impact of glossing individual vocabulary via glosses embodied by different modes and media attracts attention. Therefore, the future study will try to examine different effects of different gloss types on incidental vocabulary learning in a multimedia environment.

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