

The Effectiveness of Multimedia Gloss Modes and Languages for Chinese Learners' Incidental Vocabulary Acquisition

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Abstract: This study examines the effects of different gloss types, namely L1 text-only, L2 text-only, L1 text plus picture, and L2 text plus picture on vocabulary retention in a multimedia reading environment. This investigation is based on the cognitive theory of multimedia learning and the revised hierarchical model with image. Sixteen participants read a computerized text under one of four gloss conditions and took an immediate and delayed vocabulary retention test. Quantitative analyses in this study were based on responses to a survey, and performance data drawn from the recognition and production tasks in the vocabulary retention test. Qualitative evidence was obtained through interviews with the participants regarding their attitudes to the use of multimedia glosses. Results of this study suggested that L1 and L2 did not differ in terms of their effects on vocabulary retention. In addition, a combination of text and picture was more effective than text-only in sustaining recall of the glossed words. Survey and interview responses indicated the participants' mixed opinions about L1 and L2 definitions and their strong preferences for pictures. The positive effect of L2 plus picture type glosses for long-term retention suggested the possible important role of mental involvement in the process of L2 vocabulary acquisition.

Keywords: multimedia gloss mode, multimedia gloss language, vocabulary teaching and learning, immediate and delayed word retention

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Glosses are the annotations of unknown words placed in the margin of texts to aid comprehension. In the multimedia environment, glosses can be presented in the form of texts, images, sounds, video clips, or a combination of these modalities. One of the most frequently mentioned benefits of glosses is their effectiveness for promoting incidental vocabulary acquisition (hereafter IVA), and the efficacy of different gloss modalities for IVA has drawn a good amount of attention. Al-Seghayer, for example, found a video clip in combination with a text definition is more effective than a picture in combination with a text definition (202-232). In a more recent study, Rassaei found that learners who received

audio glosses indicated higher rate of vocabulary learning than learners who received textual glosses (657-675). On the other hand, some studies showed no differences among different modalities. Particularly, Yanguas found no significant differences among the groups receiving textual, pictorial, and textual plus pictorial in vocabulary learning (48-67). Ramezanali and Faez, in a similar vein, suggested the equal efficacy of single and dual glossing for word learning and retention (105-124).

It is important to note that the textual gloss language in the aforementioned studies were either the participants' first language (L1) or second language (L2). Thus far, only a handful of studies compared the effectiveness of L1 and L2 glosses for IVA and reported mixed results. For printed glosses, Jacobs et al. (19-28) and Chen (119-142) found no significant difference between L1 and L2. Miyasako's study, on the other hand, showed the advantage of L2 glosses over L1 glosses for short-term memory (1-20). For multimedia glosses, Yoshii's study showed that both L1 and L2 glosses were equally effective for IVA (85-101). Likewise, Ko study suggested no significant difference in favor of one text type over another (56-79).

It is clear that studies on the effectiveness of gloss modalities are inconclusive, and more evidence is needed to determine the superiority of L1 and L2 gloss for IVA. As Mohsen and Balakumar's review suggested, the textual gloss languages used in most of the multimedia gloss studies were limited to those with the same orthography (Latin form) as the participants' native languages (French, German, English, and Spanish), it is therefore essential to explore the effects of multimedia glosses on learners whose native language has a different orthography from their target language (135-159). This study therefore seeks to address this issue through a comparison of the efficacy of Chinese (L1) and English (L2) gloss for IVA on Chinese learners of English.

Literature Review

Multimedia glosses and IVA

Empirical research investigating the usefulness of multimedia glosses on vocabulary learning has proliferated since the early 2000s in part due to the advantage of using multimedia technology for vocabulary learning. The accumulation of knowledge about L2 vocabulary has long been regarded as an essential component of SLA (Candlin; Knight, 285-299), and it is a widely held belief that extensive reading is one of the most effective approaches to facilitating the comprehension of new lexical items since it enables L2 learners to infer the meaning of unfamiliar words from the surrounding context (e.g., Hunt and Beglar 7-10; Huckin and Coady 181-193; Nation, *Learning Vocabulary*). In other words, the acquisition of L2 vocabulary is most likely to occur "incidentally" during a language activity of which the goal is reading comprehension rather than explicit vocabulary instruction (Read 146-161). Multimedia glosses, defined as brief definitions or explanations associated with text, graphics, audios, and videos in computerized text¹, have been suggested by many researchers as a practical tool for facilitating reading comprehension² and incidental vocabulary learning³. Commonly mentioned benefits include the reduction of the risk of drawing incorrect inferences from ambiguous or untrustworthy contextual information, the enhancement of L2 learners' retention of the glossed words by supplying the diversity of modalities, and the choices of interactive features such as "reader control, the immediacy of access, and the absence of interruptions" (Al-Seghayer 206).

Dual glossing mode vs. single glossing mode

For multimedia gloss studies, the cognitive (generative) theory of multimedia learning (hereafter CTML, Mayer 47) seemed to be the most commonly adopted theories. Both theories acknowledged the advantage of dual glossing mode (e.g., text plus picture) over single glossing mode (e.g., text-only) in fostering the richness of recall cues through L2 learners' construction of referential connections between the verbal and visual representations (encoding) of incoming information. However, unlike the dual coding theory which regarded multimedia learning as a random, passive process, the cognitive theory acknowledged L2 learners' proactive attitude of "selecting relevant material, organizing selected material, and integrating selected material with existing knowledge" (Mayer, "Cognitive Theory" 37). It also stressed the importance of long-term memory in L2 learners' building connections between word-based and image-based representations of multimedia messages. More important, it emphasized that the integration of words, images, and prior knowledge in working memory is "an extremely demanding process that requires the efficient use of cognitive capacity" (40). Therefore, it is advisable to present the verbal and visual input simultaneously in a single gloss to reduce cognitive burden (Mayer and Moreno, 87-99) and take into consideration learner individual differences such as perceptual styles (Rassaei 657-675).

Several studies, drawing on CTML, compared the effectiveness of dual glossing mode with single glossing mode for IVA. Examples include Yoshii and Flaitz (33-58) who compared text and pictures for aiding immediate and delayed vocabulary retention. In their study, the performance of 151 adult English learners at beginning and intermediate proficiency levels was measured to judge the most effective gloss type under three conditions: text-only, picture-only, and text plus picture. In a related study with German learners, Kost et al. (89-113) investigated the effects of three electronic gloss modes on incidental vocabulary learning: text, picture and a combination of the two. Similar comparisons include Yoshii and Yanguas. Echoing the cognitive theory, these researchers suggested the advantage of combining text and picture. On the other hand, several studies regarding the comparison of gloss types incorporated audio (e.g., Yeh and Wang 131-144) or video (e.g., Al-Seghayer; Chun and Plass, 183-198) and demonstrated the benefits of multimodality such as text plus video clips for the recall of new vocabulary.

Assessment of vocabulary retention

Another prominent feature of comparative studies on the effectiveness of gloss types is the use of post-reading vocabulary tests for assessing lexical retention rates. These tests usually consisted of recognition and production tasks aimed at eliciting L2 learners' short-term and long-term retention of target words. Characteristically both tasks solely examined L2 learners' retention of word meaning rather than spelling or usage. This investigation into the semantic processing of multimedia glosses was consistent with the definition of "incidental vocabulary learning" in that it viewed the glossed vocabulary as an integral part of reading comprehension (Paribakht and Wesche 195-224). Furthermore, according to the integrated model of SLA with multimedia (Plass and Jones 476-488), the comprehension of multimedia information can be achieved exclusively by virtue of the semantic component of the verbal input. Comprehension then turns into retention through L2 learners' intake of the comprehended messages which are ultimately integrated into their interlanguage system and become output. As a form of L2 learners' output, the recall of word meaning to a large extent reflects accurately their retention rates, and by extension, the effectiveness of the gloss types to which they were exposed.

L1 vs. L2 glosses

Compared to the extensive research comparing dual with single glossing mode, only a handful of studies explored the differences between L1 and L2 verbal input for IVA, and yield conflicting results. While some studies showed the advantage of either L1 or L2 (e.g., Miyasako), others suggested that there was no difference between the two text types (Chen; Jacobs et al.; Ko). Among these studies, Yoshii's study stands out in two ways. First of all, his research was based on the revised hierarchical model with image (Kroll and Stewart 149-174) which asserted the stronger conceptual links underlying L1 than L2 for low level learners, and vice versa for higher proficiency learners. Additionally, it in part supported CTML and showed that the effectiveness of L1 and L2 for vocabulary retention might differ overtime and vary according to the nature of the data collection instruments.

To conclude, as the above mentioned studies showed, dual glossing mode is in general more effective than single glossing mode for IVA, and by and large, L1 and L2 glosses are equally effective. However, there are few studies that have investigated the efficacy of multimedia glosses with Chinese learners of English. This study is therefore replicates Yoshii's research and aims to answer the following research questions:

1. Do L1 and L2 glosses differ in terms of their effects on vocabulary retention for Chinese learners of English?
2. Are dual glossing mode (text plus picture) more effective than single glossing mode (text-only) in promoting vocabulary retention for Chinese learners of English?

Method

Participants

Sixteen students (10 male, 6 female) enrolled in an intensive program at a public research university located in the American Midwest constituted the body of participants in this study. They were taking an academic reading course of which the goal was to improve reading comprehension and vocabulary knowledge. These students were placed at the low proficiency level in terms of their performance on a standardized placement test upon entering the program. Their average age was 19 years old. All of these participants were native speakers of Mandarin Chinese. They were selected to engage in this study since they had little or no prior knowledge about the target words, as was evidenced by their pretest scores.

Instruments

The materials and data collection instruments employed in this study included the following:

1. Reading text adapted from the short story *A Scary Night* produced by Yoshii and Flaitz. It had 390 words in total and included the 14 target words and the 6 distracters in the pretest. The glossed words were highlighted in blue. Once the participants clicked on a glossed word, its definition in text or text plus picture appeared in a yellow box on top of the reading material. For text plus picture glosses, English or Chinese definitions and pictures were presented simultaneously to the participants. There was explicit coherence between the pictures and the words they illustrated.

2. A vocabulary pretest consisting of the 14 glossed words and 6 additional distracters in Yoshii's study. Participants were instructed to place a check mark next to the words they were familiar with and

also provide a brief written definition in either L1 or L2.

3. Vocabulary posttests consisting of a recognition and production task was administered to the students in separate sessions: one immediately after the treatment, and the other one two weeks after. For the recognition task, participants were asked to select the correct definitions of all 14 glossed words from four choices written in English. The correct definitions were rephrased in a simpler way to avoid participants' random guessing based on their memorization of the glosses. For the production task, participants were required to place a check mark beside the words they remembered and also supply the definitions of the 14 glossed words in Chinese or English. Participants gained one point if they identified the correct choices or supplied the cogent definitions. Incorrect choices and definitions resulted in a score of zero. The total scores for both tests were fourteen. Participants were not informed the tests in advance so that they would not intentionally review the vocabulary in the tests.

4. An online questionnaire was distributed to the participants prior to the treatment activity to gather the participants' background information. A survey was conducted one day after the treatment to elicit the participants' opinions about the use of multimedia glosses. Both the questionnaire and the survey consisted of multiple-choice, five-level Likert, and open-ended questions. A ten to fifteen minute interview was carried out after the survey to gather further information.

Procedures

This study consisted of three sessions that were carried out on four different days. The treatment session overlapped with participants' scheduled computer lab hours and was comparable to their regular classroom reading activities. During the first session, the researcher introduced the study to the students and obtained their consent. The students were informed that the goal of the study was to learn English vocabulary through multimedia reading. Those students who agreed to participate were asked to complete the online questionnaire. They also took the pretest afterwards. Those who scored higher than four points in the pretest were singled out. The treatment was administrated one week after the first session. As an initial step, the researcher assigned the participants randomly to four groups and demonstrated to each group how to click on a glossed word. Participants were also told that they could check the glosses when necessary during reading. After the training, participants started to read the story individually with the aid of glosses. The actual duration of treatment was 15 to 20 minutes. As soon as the participants finished reading, they were instructed to log off the computer and responded to the immediate vocabulary test without notice beforehand. The production task was carried out before the recognition task to avoid the participants' using the answers in the recognition task for the production task. One day after the treatment session, the participants filled out the survey and engaged in the interview. The delayed vocabulary test was implemented two weeks later to assess the participants' long-term retention.

Results

Effectiveness of L1 versus L2 Glosses

Table 1 shows the mean scores for all of the four groups in tackling the production and recognition tasks. Based on the relative amount of correct answers produced by the participants on the immediate and delayed tests, it is possible to determine the extent to which L2 learners retained the glossed,

unknown vocabulary. The descriptive statistics in particular suggests that on average L2 text-only group slightly outperformed L1 text-only group on the immediate and delayed production

Table1. Mean scores and standard deviations of the pretest, immediate test, and delayed test

		L1 Text--only		L2 Text- - only		L1 Text + Picture		L2 Text + Picture	
		M	SD	M	SD	M	SD	M	SD
Pretest	Production	0.5	0.56	1.25	1.26	1.50	0.58	1.75	1.5
Immediate	Production	5.25	2.75	7	3.83	6.5	3.32	5.25	2.22
	recognition	8	2.16	9.75	2.06	8.5	4.20	8.25	2.06
Delayed	Production	1.75	0.5	3.75	2.22	2.25	2.06	4.25	3.59
	recognition	6.5	1.29	7.5	2.38	7	2.83	8	1.83

Note. M=mean score; SD=standard deviation

and recognition tasks. The independent samples t-test failed to reveal a significant difference between L1 and L2 text-only glosses in immediate production ($p=.24$) and recognition ($p=.29$), and delayed production ($p=.13$) and recognition ($p=.49$). Similar to the comparison between L1 and L2 text-only groups, the independent samples t-test did not show a significant difference between L1 and L2 text plus picture glosses in immediate production ($p=.48$) and recognition ($p=.08$) or delayed production ($p=.09$) and recognition ($p=.11$). As such, neither the definition supply nor the word recognition task result in this study supported the revised hierarchical model with image, which echoed the findings of Yoshii (2006) and previous studies with printed glosses (e.g., Chen; Jacob et al.). Particularly it indicates that L1 and L2 glosses may not differ in their effects on vocabulary retention for low level Chinese learners of English.

Effectiveness of Text-only versus Text plus picture

The second research question compares the effectiveness of text-only and text plus picture glosses for IVA. A closer look at Table 1 makes it clear that L1 text plus picture group had better performance than L1 text-only group on both the immediate and delayed vocabulary tests, although the differences between these two groups were quite small. The independent samples t-test confirmed this result since a significant difference was not found between L1 text-only and L1 text plus picture glosses in immediate production ($p=.58$) and recognition ($p=.84$) or delayed production ($p=.65$) and recognition ($p=.76$). On the other hand, L2 text-only group on average scored higher than L2 text plus picture group in terms of immediate production and recognition, and lower than L2 text plus picture group on delayed production and recognition. The independent samples t-test again failed to indicate a significant difference between L2 text-only and L2 text plus picture glosses in immediate production ($p=.46$) and recognition ($p=.34$) and delayed production ($p=.82$) and recognition ($p=.75$). Overall, the results support CTML and show that a combination of text and picture was more useful than text alone in promoting vocabulary retention.

Additionally, paired t-test samples showed a significant difference between the pretest scores and the immediate production scores ($p=.16$, Cohen's $d=-2.29$), suggesting the use of multimedia glosses, either in text-only or text plus picture conditions, had a noticeable impact on L2 learners' immediate gain in vocabulary knowledge. Furthermore, a comparison between the mean scores of the immediate

and delayed vocabulary tests confirmed the advantage of the use of dual glossing mode. Table 1 suggests that in contrast to the drastic decrease of recognition rates among the other three groups, L2 text plus picture group was capable of sustaining their average score. The decline of production rates was comparatively less striking; however, L2 text plus picture group was still able to maintain their mean score to the largest extent. This result indicates that participants using L2 and picture glosses retained the target lexical items better than the ones using other types of glosses.

Insights from the Survey and Interviews

Participants' responses to the survey and interviews supplemented provided additional insights into L2 learners' attitudes towards the use of multimedia glosses. From Table 2 showing the results from the survey, it is interesting to note that the majority of the participants deemed L1 and L2 equally effective for their retention of the target vocabulary. Reasons for the preferences of L1 definition include the relative ease of processing mother tongue and the efficacy of retrieving the definitions from their memories. Inclination toward L2 stemmed from the deeper impression of the target vocabulary resulting from the efforts to understand the English explanation, and the consistency of L2 glosses with the reading text. Additionally, there were mixed opinions about the usefulness of images as half of the participants showed their approval for visual definitions and the other half disagreed with them. Comments in favor of pictures included "aiding memorization," "helping understand the words easily and quickly," and "more vivid and concrete." Doubts about the use of pictures involved "helpful but not necessary for definitions" "not all words can be explained by using pictures." As one participant put: "I don't think I will do better without pictures. We must use more strategies to remember the new words. Some pictures can help us see the concept these words denote so I can remember the definitions more easily. I can also recall the meaning of these words by thinking about the pictures. They are very useful."

Table 2. Opinions about the usefulness of multimedia gloss types

	Strongly disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
L1 is better				4	4	
L2 is better			2	3	2	1
Text only is better		2	2	2	2	
Picture is better				2	5	1

Discussion

The present study aimed to compare the effectiveness of L1 and L2 glosses, and dual glossing mode and single glossing mode for IVA. One of the findings was that both L1 and L2 glosses are useful for increasing Chinese learners' retention of the target English vocabulary, and L1 and L2 glosses do not differ in terms of their efficacy for IVA. The result of this study is in line with several other studies in this domain. First, it is in tune with Yoshii, who found no significant differences between L1 and L2 glosses for definition-supply and recognition tasks. It is also consistent with Ko, who showed no significant differences between texts with L1 glosses and L2 glosses. One possible explanation for why L1 glosses was not more effective than L2 glosses for promoting IVA, according to Yoshii, was the learners' failure to establish the conceptual link between L1 and the target

vocabulary in the limited amount of time given. Another possible reason, as Mohsen and Balakumar pointed out, was the mismatch of language between glosses and assessment tools. In this study, the word recognition task required the participants to match the target words with the corresponding English definitions, which may pose extra cognitive burden on the learners even though they might grasp the L1 definitions to a large extent. The definition supply task allowed the participants to write the meaning of the target vocabulary in either English or Chinese; however, as Mohsen and Balakumar noted, the participants' might have difficulty finding the exact term in L1 to correspond with the concept in L2. In a nutshell, the result of this study failed to support Kroll and Stewart hierarchical model suggesting the stronger word-to-concept link that L1 has than L2, and showed that glosses seem to increase IVA effectively regardless of language types.

Another finding was that dual glossing mode is advantageous over single glossing mode in the facilitation of IVA. As the result of this study showed, text plus picture group in general outperformed text-only group in both word recognition and definition-supply tasks, and L2 plus picture group was capable of sustaining memories of the target word definitions overtime. This supported CTML and suggested the advantage of presenting textual and pictorial input simultaneously to the learners in aiding in their acquisition of word meaning. Furthermore, unlike Yoshii, the effectiveness of dual glossing mode in this study did not seem to vary noticeably according to the nature of the tasks. Apart from the small number of participants, one possible explanation might be that the pictures used in this study were far more complex than the simple sketches in Yoshii's study. The extra cognitive efforts required on the part of the participants for interpreting and processing the images might to a large extent prevent them from using the images as cues for retrieving the meaning of the target words in the completion of both the word recognition and definition supply tasks. Additionally, as Yoshii noted, the L2 tended to benefit from the additional pictures more than the L1 did simply because the difficulty processing the L2 definitions drove them to rely on pictures for assistance. Similarly, in this study, the difficulty of understanding L2 definitions pushed them into resorting to pictures as the cue for comprehension, and this greater involvement in turn enhanced their immediate and long-term retention of the definitions.

The results of this study suggest that L1 and L2 glosses do not differ significantly in terms of their effects on vocabulary retention for low level ESL learners. In addition, text plus picture type glosses are slightly more effective than text-only type glosses on low level ESL learners' retention of unfamiliar words. Survey responses and interviews supported quantitative analyses by showing ESL learners' mixed attitudes towards L1 and L2 glosses and strong preferences for verbal and visual representations. The positive role of English plus picture glosses in promoting vocabulary retention may signal the importance of Chinese learner's mental involvement in both short-term and long-term memory. Although inferential statistics in this study failed to reveal a significant difference among the four types of glosses, compared to the participants' performance prior to the treatment, it is safe to conclude that overall the use of glosses, either in L1 or L2, text-only or text plus picture conditions, is quite useful for vocabulary learning.

Since there is not a significant difference between L1 and L2 glosses, English learners, especially those at low proficiency levels should be given the option of choosing between L1 and L2 definitions. In addition, based on the distinct effects that L2 plus picture type glosses had on vocabulary retention in this study, it is important to design the kind of glosses that integrate English and pictorial explanations. English teachers, on the other hand, should encourage the use of dictionaries that contain

English definitions and illustrations (e.g., the Merriam-Webster Visual Dictionary Online) for their reading class even though the learners' reading abilities are considered very low. Additionally, learners should be trained on linking verbal and visual cues for efficient vocabulary learning.

This study has a few limitations. First of all, any conclusions made in this study are restricted by the small number of participants involved. Second, this study solely focused on Mandarin Chinese speakers at low level proficiency. Third, the target words and pictures employed in this study were all verbs and real-life images. Fourth, the interval between short-term and long-term retention in this study was only two weeks. Finally, the production and recognition tasks in this study did not elicit the learners' use of the glossed vocabulary in specific contexts. As such, future studies need to explore the effectiveness of L1 and L2, text-only and text plus picture type glosses on vocabulary retention with a larger group of participants from a diverse L1 background. It is also essential to investigate the differences between L1 and L2 glosses for intermediate or advanced English proficiency learners. Nouns and abstract words can be integrated in the glosses and a longer interval between immediate and delayed post-reading tests is necessary to determine the impacts on long-term retention. Most importantly, results from online measures such as think-aloud should be used to offer a glimpse of the learners' mental process when dealing with the glossed words.

Notes

1. See P. A. M. Kommers, et al., *The Technology of Hypermedia Learning Environments: Instructional Design and Integration*. Lawrence Erlbaum, 1996.
2. See D. M. Chun and J. S. Payne, "What Makes Students Click: Working Memory and Look-up Behavior." *System*, no. 32, 2004, pp. 481-503; G. Ercetin, "Exploring ESL Learners' Use of Hypermedia Reading Glosses," *CALICO Journal*, vol. 20, no. 2, 2003 pp. 261-283; Jacobs, et al., "L1 and L2 Vocabulary Glosses in L2 Reading Passages: Their Effects for Increasing Comprehension and Vocabulary Knowledge"; L. L. Lomicka. "To Gloss or not to Gloss": An Investigation of Reading Comprehension Online." *Language Learning and Technology*, vol. 1, no. 2, 1998, pp. 41-50; I. De Ridder, "Visible or invisible links: Does the highlighting of hyperlinks affect incidental vocabulary learning, text comprehension, and the reading process?" *Language Learning and Technology*, vol. 6, no.1, 2002, pp. 123-146; Yanguas, "Multimedia glosses and their effect on L2 text comprehension and vocabulary learning."
3. See D. M. Chun and J. L. Plass, "Effects of Multimedia Annotations on Vocabulary Acquisition." *The Modern Language Journal*, vol. 80, no. 2, 1996, pp. 183-198; Grace, C. "Retention of Word Meanings Inferred from Context and Sentence-level Translations: Implications for the Design of Beginning-level CALL Software," *The Modern Language Journal*, vol. 82, no. 4, 1998, pp. 533-544; "Gender Differences: Vocabulary Retention and Access to Translations for Beginning Language Learners in CALL," *The Modern Language Journal*, vol. 84, no. 2, 2000, pp. 214-224; Hulstijn, et al., "Incidental Vocabulary Learning by Advanced Foreign Language Students: The Influence of Marginal Gloss, Dictionary Use, and Reoccurrence of Unknown Words." *The Modern Language Journal*, vol. 80, no. 3, 1996, pp. 327-339; Jacobs, et al., "L1 and L2 Vocabulary Glosses in L2 Reading Passages: Their Effects for Increasing Comprehension and Vocabulary Knowledge"; C. R. Kost, et al., "Textual and Pictorial Glosses: Effectiveness of Incidental Vocabulary Growth When Reading in a Foreign Language"; Noriko Nagata, "The Effectiveness of Computer-Assisted Interactive Glosses." *Foreign Language Annals*, vol. 32, no. 4, 1999, pp. 469-479; Y. Yeh and C. Wang, "Effects of Multimedia Vocabulary Annotations and Learning Styles on Vocabulary Learning," *CALICO Journal*, no. 21, no. 1, 2003, pp. 131-144; M. Yoshii, "L1 and L2 Glosses: Their Effects on Incidental Vocabulary Learning"; M. Yoshii and J. Flaitz, "Second Language Incidental Vocabulary Retention: The Effect of Picture and Annotation Types."

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