Introduction

The acquisition of second language (L2) vocabulary usually involves learning the linguistic form and acquiring the concept underlying the meaning of the words. Although different languages may have distinctive orthographic and phonological systems, the concepts represented by lexical items tend to overlap to a great extent because of similar world experiences among human beings. The common concepts in learners' first language (L1) and second language, accordingly, may mediate learners' understanding of L2 words. Indeed, studies on cross-language priming have revealed that conceptual mediation is at work when learners acquire L2 word meanings (e.g., Schwanenflugel & Rey, 1986).

How, then, is L2 lexicon represented in the memory? Researchers have pointed out a distinction between representation at the lexical level and that at the conceptual level. Lexical representations include only aspects of word form while semantic meaning is grouped with conceptual representation. To account for the connections between these two types of representations, two models have been proposed. First, the word association model states that L2 words activate conceptual representations via their L1 translation equivalents. The concept mediation model, in contrast, suggests that words in two languages can directly access the shared conceptual system (Kroll, 1993; Kroll & de Groot, 1997).

Despite the lack of consensus in which model wins over the other, researchers generally recognized the critical role of L2 proficiency. Depending on different levels of L2 proficiency, learners may exercise different degrees of conceptual mediation through L1 translations or L2 words (Chen & Ho, 1986; Kroll & Sholl, 1992). In the case of polysemy, or words with related senses belonging to the same schema (Tuggy, 1993), conceptual mediation may be crucial for understanding word senses. Accessing the concepts of a polysemous word, accordingly, may promote the comprehension of its senses because these concepts are likely to underlie the meanings of the related senses.

With an emerging interest in polysemy, researchers have developed semantic theories to capture the conceptual network that connects multiple senses of polysemy. Among these theories, Frame Semantics holds that people's knowledge

of the organization of the physical and social worlds provides the conceptual structures, or semantic frames, for the usages of words (Fillmore, 1985). To know the meaning of a word, it is necessary to understand the background frames that motivate the concept encoded by the word. Similarly, multiple senses of a word are related to each other through their links to common background frames (Fillmore, 1985; Fillmore & Atkins, 1992).

Based on these notions, Frame Semantics has been applied to analyzing individual polysemous words (Baker, 1999; Petruck, 1995) and to comparing syntactic and semantic variations of words from different languages (Boas, 2001; Pedersen, 1999). Although Frame Semantics is powerful in explaining the relatedness of word senses, it has rarely discussed about how semantic frames can be used to activate L2 word concepts. It remains to be seen whether L2 learners can apply semantic frames to understanding word senses. Accordingly, this study aimed to investigate how English L2 learners used semantic frames as a cue to access the underlying concept of polysemous verbs. It was hoped that the results would shed light on how semantic frames could be applied to the acquisition of L2 word meanings and how the comprehension of word senses could be promoted through the activation of word concepts.

Literature Review

The review of literature first introduces the proposal of Frame Semantics and explains the use of semantic frames in understanding word senses. The second part presents empirical studies on the access of L2 word concept. The research hypotheses for this study are stated in the last section.

Frame Semantics and Disambiguation of Polysemy

Frame Semantics proposes that word senses are connected by related cognitive structures, i.e., semantic frames (Fillmore, 1985). Frames are knowledge schemata that represent "a structured background of experience, beliefs, or practices" that constitutes a conceptual prerequisite for understanding word meanings (Fillmore & Atkins, 1992, pp. 76-77). Word senses are mutually related through their links to common background frames, with each sense highlighting

specific frame elements. Frame elements refer to the various conceptual roles involved in the schematic representations of situations (Johnson et al., 2002). For example, to understand the meanings of verbs in the COMMERCIAL TRANSACTION frame such as *buy, sell,* and *pay,* it is necessary to have the background knowledge that a commercial transaction situation typically involves a buyer and a seller exchanging money and goods. These four participant concepts, i.e., Buyer, Seller, Money, and Goods, constitute the primary elements of the COMMERCIAL TRANSACTION frame (Petruck, 1996).

Frame Semantics illustrates not only the connection of word senses through particular semantic frames but also the syntactical realizations of frame elements. Take the polysemous verb *risk* for example. Different syntactic realizations or collocations of *risk* are all encompassed in the RISK frame, with two major notions, chance and harm, as the basis of the conceptual structures (Atkins, 1995). Certain frame elements are specified in some uses of *risk* whereas other elements may be involved in other uses. For instance, in the sentence *He risked his life, his life* represents the frame element of Possession, something valued by the frame element of Protagonist (i.e., *He*) and endangered in the situation. In *He risked swimming, swimming* becomes the element of Decision that could trigger possible harm. A metonymic use of *risk* in *risk the river* can also be understood by assigning the frame element of Decision to *the river* (Atkins, 1995).

Research in this field provides not only the conceptual underpinnings for the formation and understanding of polysemy but also the prediction of sense extensions (Petruck, 1996). Viewing word senses as different but interrelated perspectives of conceptual categories, or slots, Martin (1997) claimed that the slots of a frame may yield metonymic and metaphorical uses of a word. For example, *fox* can be used to refer to the fur of a fox because the slot of skin in the ANIMAL frame creates metonymic relations between the referent of an animal and its skin. Another example shows that *giraffe* can be used as a metaphor for a tall person because the slot of size for *giraffe* is specified as being tall. Consequently, the background frame and frame elements not only cover the different grammatical patterns of a polysemous word but also relate its literal senses with its metonymic and metaphorical uses.

Another important concept of Frame Semantics concerns frame invoking and evoking. When trying to make sense of a text, the hearer/reader invokes background frames that are necessary for interpreting the text. The interpretive frames are evoked by the words in the sentence as well as the text within which the sentence occurs (Fillmore, 1985). Therefore, the process of comprehending a text involves frame invoking by the interpreter and frame evoking by the text. Applying such ideas to understanding novel senses of a polysemous word, language users have to first invoke an appropriate background frame that has been evoked by the core sense or other senses of the word. Then, users can use the frame, i.e., the concept underlying the polysemous word, to comprehend new, unfamiliar senses.

Access of L2 Word Concepts

To explain how the concept represented by L2 lexicon can be activated, the two models of word association and concept mediation, as mentioned previously, take different perspectives. The former emphasizes the mediating role of L1 translation equivalents in accessing the shared conceptual representation while the latter proposes a direct access from L2 words. To solve this issue, Potter, So, Von Eckardt, and Feldman (1984) compared L2 learners' performance in translation and picture naming tasks, assuming that the former required word association and the latter concept mediation. They found that learners across proficiency levels could mediate the L2 conceptually. However, Talamas, Kroll, and Dufour (1995) reported that less proficient learners experienced more interference from form than from meaning in a translation recognition task whereas the opposite pattern was found in more fluent learners. These results, together with those generated from other types of tasks, have suggested a developmental process from lexical to conceptual processing with increasing proficiency in the L2 (see a review in Kroll & de Groot, 1997).

In addition to L2 proficiency, factors such as the dominance of L1 and the degree of similarities between the two languages also affect the amount of word association or conceptual mediation found in the processing of L2 words. Kroll and her colleagues (Kroll, 1993; Kroll & Stewart, 1994) have proposed asymmetrical strengths of lexical-to-conceptual connections between L1 and L2. As L1 lexicon is

substantially larger than that of L2 for most bilinguals, there seem to be stronger lexical links from L2 to L1 but stronger conceptual links from L1 to L2.

Similarly, Jiang (2000) argued that due to insufficient contextualized input, learners who acquire their L2 in an instructional setting start with a pre-existing conceptual/semantic system that is associated with L1 lexicon. During the initial stages of L2 learning, the connection between L2 lexicon and conceptual representations remains weak because learners tend to use L1 lemma information to mediate L2 word processing. Only when learners acquire the L2 lemma information and integrate it into lexical entries can they use L2 lexicon to access conceptual representations directly. What Jiang suggested is that L2 learners may have a strong tendency of relying on the concepts of L1 translation equivalents to comprehend L2 word meanings. Unfortunately, it is rarely documented as to how the access of word concepts, either in L1 or L2, impacts learners' comprehension of L2 polysemy.

Research Hypotheses

Therefore, the current study aspired to investigate how Chinese EFL (English as a foreign language) learners comprehended English polysemous verbs by accessing word concepts in the target language. Following the theoretical framework of Frame Semantics, a semantic frame cue was hypothesized to evoke the underlying concepts of a polysemous word and thus be able to promote the comprehension of an unfamiliar sense. The study also tested how English polysemy could be disambiguated through other types of cues, i.e., elaborated context and meaning chains in Experiment 1, and elaborated context in Experiment 2.

The rationale for using the cue of elaborated context was based on psycholinguistic research that identified context as a major resource in resolving lexical ambiguity. Context aided the selection of the intended meaning of an ambiguous word (e.g., Tabossi & Sbisa, 2001; Williams, 1992). In the field of second language acquisition, guessing word meanings from context is also a useful strategy for acquiring L2 vocabulary. Learners who have reached a threshold of vocabulary proficiency are generally good at this strategy (Nagy, 2001; Nation, 2001). Therefore, it was hypothesized that rich contextual information would aid

the understanding of unfamiliar word senses.

The theoretical basis for the cue of meaning chains came from the theory of family resemblance. The theory holds that the related senses of a word constitute a category and resemble one another just like members in a family (Taylor, 1995). Senses in the same category may center around or form a chain with a central sense. Polysemy, accordingly, may arise from small extensions of the core sense from which other meanings are computed in various contexts (Clark, 1993). So far, empirical studies have confirmed L1 speakers' use of meaning chains in understanding novel senses (Murphy, 1997). It is thus reasonable to assume that, by exercising analogy, L2 learners may be able to process word senses through meaning chains that start with the core sense.

Experiment 1

This experiment purported to examine the effects of different cue types on the understanding of English polysemy. Prior to the experiment, screening procedures were used to generate 18 unfamiliar senses of 18 polysemous verbs. These senses then served as the test items in this experiment.

Method

Participants. The participants were 49 sophomores in a university in southern Taiwan. They had received at least six years of English instruction in high school and one year in university before the experiment. As English majors at a well-reputed university, they could be categorized as high-intermediate learners of English in terms of their lexical knowledge and overall English proficiency.

Instruments. The first set of instrument consisted of a translation task and a multiple-choice task. Both tasks contained the aforementioned 18 verb items, each of which was embedded in a sentential context. In the translation task, a 5-point Likert scale for confidence ratings was presented below each test item, with 1 as *completely unsure* and 5 as *completely sure*. Likewise, the same scale was used in the multiple-choice task, which showed a target item and a question of four options.

The second set of instrument comprised three types of experimental cues and a no-cue condition. The cue of semantic frames was a sentence involving a verb

under the same semantic frame as the target sense. For instance, the tested sense of the polysemous verb *swim* was "appearing to whirl before one's eyes." This sense belongs to the SELF-MOTION frame (Johnson et al., 2002). From a pool of lexemes under the frame, the verb *hurry* was selected to form the cue: *She hurried across the road to take the bus.* (Please see Appendix A for the semantic frame cues used in this experiment.) The cue of elaborated context was designed with two sentences that set the stage for processing the tested sense. For example, the target sentence for the above sense of *swim* was *The words on the page are swimming before my eyes.* The cue read *My headache started two hours ago. Now it is getting worse while I am reading the book.* In the condition of meaning chains, the cue contained two or three sentences, with one having the core sense of the polysemous verb and the rest a sense connecting the core and the target senses. The core sense of each verb was obtained based on students' subjective judgment in a preliminary experiment. For *swim*, the cue involved *(a) I learned to swim when I was ten* (*swim* having the core sense of "propelling oneself through water by bodily movement") and *(b) I have put many kinds of vegetables in the soup. Can you see them swimming in the soup?* (*swim* as "being immersed in liquid").

The two sets of materials were combined and typed on 8 × 3.5 inch paper sheets to form a booklet. For each test item, a particular type of cue was shown on the first sheet, the translation task on the second, and the multiple-choice task on the third. A set of practice trials was likewise created for each cue condition to familiarize the participants with the procedure of using cues to derive correct answers.

Data collection and analysis. Participants were randomly assigned to the four cue conditions with 12 in each of the three experimental conditions and 13 in the control condition. They took the test collectively in their regular classroom. Each participant worked on practice items first and then completed a booklet containing the 18 test items. They were given sufficient time to finish the test, which took approximately 45 minutes.

Using a between-subject design, this experiment involved four cue conditions as the independent variable and the performance in the translation and multiple-choice tasks as the dependent variable. After the answer sheets were

collected, the accuracy of each participant's response to each item was determined. Then, the proportion of correct responses for each participant was obtained. Next, the mean proportion of items answered correctly in each condition was calculated separately for each task. The mean proportion for the multiple-choice task was adjusted for guessing. Last, one-way ANOVA's were carried out to compare the effects of different cue types on the participants' accuracy of answers.

Another scoring method of combining accuracy of answers and confidence ratings was also applied. First, a score identical to an individual's rating was assigned to each correct answer, and a score with a negative sign identical to the rating was given to each incorrect response. For example, if a participant answers Item 1 correctly and rates his/her confidence as 3, he/she gets 3 points as the score for this item. If the participant answers the item incorrectly, he/she then gets -3 points instead. Again, one-way ANOVA's were used to compare the participants' overall performance in four conditions.

Results

As shown in Table 1, the condition of semantic frames had a higher mean than the control condition for the multiple-choice task but not for the translation task. However, such supremacy of semantic frame cues did not reach a significant level of .05. The effect of the meaning chain cues was neither significant. This type of cues actually elicited means lower, though not significantly lower, than the control condition. Among all the conditions, the highest mean occurred in the condition of elaborated context. As shown in the planned comparison, it was the elaborated context cue that induced significantly higher scores than the control condition, but only for the multiple-choice task. For the translation task, no significant differences were found between any experimental condition and the control condition.

Table 1. Proportion of items answered correctly in the two tasks

Condition	Translation		Multiple-choice	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
A (semantic frames) (N=12)	0.47	0.16	0.47	0.25
B (elaborated context) (N=12)	0.59	0.09	0.62	0.19
C (meaning chains) (N=12)	0.49	0.13	0.38	0.16
D (control) (N=13)	0.54	0.14	0.44	0.20
Planned comparisons of conditions	**Translation**		**Multiple-choice**	
A against D	$F = 1.81$	$p = .185$	$F = 0.13$	$p = .725$
B against D	$F = 0.75$	$p = .391$	$F = 3.29$	$p = .029*$
C against D	$F = 0.88$	$p = .353$	$F = 0.65$	$p = .424$
Overall	$F = 1.89$	$p = .145$	$F = 3.29$	$p = .029*$

Note. $*p < .05$.

Table 2. Participants' performance on two tasks: Combining accuracy and confidence ratings

Condition	Translation		Multiple-choice	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
B (semantic frames) (N=12)	5.00	18.11	17.25	23.53
A (elaborated context) (N=12)	17.75	12.44	32.08	20.02
C (meaning chains) (N=12)	2.42	16.04	6.17	14.54
D (control) (N=13)	9.23	18.74	11.92	16.62
Planned comparisons of conditions	**Translation**		**Multiple-choice**	
A against D	$F = 0.41$	$p = .527$	$F = 0.49$	$p = .486$
B against D	$F = 1.65$	$p = .205$	$F = 7.07$	$p = .011*$
C against D	$F = 1.06$	$p = .310$	$F = 0.58$	$p = .452$
Overall	$F = 1.97$	$p = .132$	$F = 4.15$	$p = .011*$

Note. $*p < .05$.

Table 2 presents the results generated by combining accuracy of answers and confidence ratings. Similarly, the semantic frame cues elicited a higher mean than the control condition for the multiple-choice task but a lower mean for the translation task. Again, the elaborated context cues generated the highest mean among all the conditions. Surprisingly, the meaning chain condition had very low means for both tasks. The planned comparisons indeed revealed significant differences only between the elaborated context condition and the control condition for the multiple-choice task. As for the translation task, no significant differences were found among the experimental and control conditions. These results indeed paralleled with what was presented in Table 1.

Discussion

The results of Experiment 1 showed that the elaborated context cue seemed most helpful to the participants' comprehension of polysemous words as measured by the multiple-choice task. Unfortunately, the semantic frame cue appeared to be ineffective. Several reasons may explain the ineffectiveness of this type of cue. First, the nature of the verb in a cueing sentence was found to affect the power of a cue. Generally speaking, if the verb is a synonym of the target sense, the participants had a higher accuracy rate. For items that did not use synonyms as cues, the participants either failed to use the cues as help or misunderstood the precise meaning of the target sense. Such differences in performance suggested the participants' tendency of interpreting the tested sense with the L1 translation of the cueing verb. In other words, the participants seemed to rely heavily on L1 word associations.

Obviously, learners' L1 exerted an impressive influence on their performance. For example, for the tested sense of *run* as "color dissolving and spreading," many participants translated it as *tùn-sè,* which was considered a correct translation. But this polysemous Chinese lemma has a dominant sense of "color fading." Those who focused on this meaning dimension tended to misinterpret the target sense and thus scored incorrectly in the subsequent multiple-choice task. The participants' over-reliance on their L1 also pointed to a possible flaw in the design of semantic frame cues. The use of one single sentence involving a cueing verb might encourage the participants to treat the cueing verb as a synonym of a target item and to overuse L1 word associations. Theoretically, the premise of semantic frames lies in the activation of the background frame that connects the meanings of different words. To this end, a deep processing of word meanings is required to assure the activation of the underlying concepts. This type of cue thus needs to be revised to increase the likelihood of accessing a target word concept in L2.

Experiment 2

Experiment 2 was designed in a slightly different way, taking into account the design flaws of Experiment 1. First, the semantic frame cue was revised to involve a brief description of the shared semantic frame and an example sentence with a

cueing verb. It was hoped that such a design would encourage learners to access the shared background frame represented by the cueing verb and the tested sense. Next, test items that had low discriminative power were deleted and new items added. Such a process of item development generated a total of 24 target senses to be tested in this experiment. The cue of meaning chains was left out of this experiment due to some problems associated with the cue that could not be solved with the current research design. Last, task order was added as a new variable. Accordingly, Experiment 2 used cue type (3 levels: elaborated context, semantic frames, no-cue) and task order (two levels: translation followed by multiple-choice and vice versa) as two independent variables and performance in the translation and multiple-choice tasks as the dependent variable.

Method

Participants. Participants were 98 English-major sophomores in a university in Taiwan. Having a similar background in English learning as the participants in Experiment 1, they were also categorized as high-intermediate EFL learners.

Instruments. The instruments resembled those used in Experiment 1 but two different sets were created because of two different task orders. The first set consisted of one type of cue, a translation task with a confidence rating scale, followed by a multiple-choice task with a confidence rating scale. The second set presented a cue first, followed by a multiple-choice task with a confidence rating scale, and last, a translation task with the scale. The sets of items were typed on 8 × 3.5 inch paper sheets and were organized into a booklet. Totally the booklet contained 24 target items that were arranged in a random order.

In this experiment, the semantic frame cue consisted of a brief definition of the target semantic frame and an example sentence with a cueing verb. The definition was created based on the *FrameNet Database* (Johnson et al., 2002). Take *swim* for example. Its tested sense "appearing to whirl before one's eyes" belongs to the SELF-MOTION frame. The cue for this target sense thus read, "Something or someone moves to a place in a particular way. For example, *She hurried across the road to take the bus.*" (Refer to Appendix B for the semantic frame cues used in this experiment.) The elaborated context cue, on the other hand, was designed in the same way as in Experiment 1.

Data collection and analysis. All participants took the test simultaneously in their regular classroom. As a 3 × 2 between-subject design, the experiment created six cells as a function of three cue types and two task orders. Fifteen to seventeen students were randomly assigned to each of the six cells. After finishing a set of practice trials, each student received a booklet of one version of test items. Participants were given sufficient time to finish the test. The entire test took approximately 60 minutes.

The procedure of scoring the responses resembled that in Experiment 1. After each participant's proportion of correct responses was calculated, the mean proportion of correct items in each of the six cells was obtained for the two tasks respectively. The means for the multiple-choice task were adjusted for guessing. Two-way ANOVA's were carried out to compare the main effects of the two independent variables and to detect any interaction between them.

The scoring method of combining accuracy of responses and confidence ratings, as used in Experiment 1, was repeated here. After each participant's score was calculated, the mean combined score for each condition was obtained. Again, two-way ANOVA's were used to determine if there was any significant main effect or interaction effect for the independent variables.

Results

The results indicated a significant main effect of cue type on both tasks: $F_{(2, 92)} = 8.29$, $p < .001$ for Translation and $F_{(2, 92)} = 38.30$, $p < .001$ for Multiple-choice. By contrast, there was no significant main effect of task order on either task: $F_{(1, 92)} = 1.85$, $p = .177$ for Translation and $F_{(1, 92)} = 1.23$, $p = .271$ for Multiple-choice. Likewise, no significant effect was found between the interaction of the two factors: $F_{(2, 92)} = 2.82$, $p = .065$ for Translation and $F_{(2, 92)} = 1.32$, $p = .273$ for Multiple-choice.

Because the main effect of task order was not significant, only the means of three cue conditions were analyzed using post hoc comparisons. As shown in Table 3, both types of experimental cues induced higher means than the control condition in the two tasks. Post hoc comparisons also exhibited their significant supremacy over the no-cue condition. Between the two types of cues, the elaborated context cue was found to be significantly more effective than the semantic frame cue as

measured in the multiple-choice task.

Table 3. Proportion of items answered correctly in two tasks

Descriptive Statistics	Translation		Multiple-choice	
Condition	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
A (semantic frames) (N=32)	0.48	0.15	0.47	0.11
B (elaborated context) (N=33)	0.46	0.11	0.56	0.11
C (control) (N=33)	0.37	0.11	0.30	0.14
Post hoc comparisons	**Translation**		**Multiple-choice**	
A against C	$p = .001*$		$p < .001*$	
B against C	$p = .010*$		$p < .001*$	
A against B	$p = .706$		$p = .011*$	

*Note. *$p < .05$.

Table 4 presents the results generated by combining the accuracy of responses and confidence ratings. Again, for both tasks, only the main effect of cue type was found significant: $F_{(2, 92)} = 6.60$, $p = .002$ for Translation and $F_{(2, 92)} = 44.86$, $p < .001$ for Multiple-choice. By contrast, the main effect of task order was not significant: $F_{(1, 92)} = 0.97$, $p = .326$ for Translation and $F_{(1, 92)} = 0.67$, $p = .415$ for Multiple-choice. Neither was the interaction of the two factors significant: $F_{(2, 92)} = 1.32$, $p = .272$ for Translation and $F_{(2, 92)} = 1.72$, $p = .184$ for Multiple-choice.

Based on these results, post hoc comparisons were carried out only for the variable of cue type. The outcome is presented in the lower panel of Table 4. Converging to the results in Table 3, the participants who received either type of experimental cues outperformed those receiving no cues as measured in both tasks. Again, participants who received the elaborated context cue scored significantly higher than those receiving the semantic frame cue in the multiple-choice task.

Table 4. Mean combined scores in two tasks

Descriptive Statistics	Translation		Multiple-choice	
Condition	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
B (semantic frames) (N=32)	- 0.125	23.01	19.00	13.73
A (elaborated context) (N=33)	- 4.182	19.14	35.48	17.46
C (control) (N=33)	- 17.091	17.88	- 2.30	17.72
Post hoc comparisons	**Translation**		**Multiple-choice**	
A against C	$p = .003*$		$p < .001*$	
B against C	$p = .028*$		$p < .001*$	
A against B	$p = .694$		$p < .001*$	

*Note. *$p < .05$.

In addition to the above quantitative results, an item analysis was carried out to determine the degree of difficulty created by each item. The analysis compared two types of statistics for each item: the percentage of participants who answered the item correctly and the mean combined score. Generally speaking, the results of such an analysis echoed the quantitative results although students' performance was found to vary across items. In terms of the condition of semantic frames, several items were revealed as easy ones; they were *run, steal, pick, fix,* and *swim* for the translation task and *buy, knock, throw, wash, bring, fail, carry, pick,* and *send* for the multiple-choice task. These items elicited a percentage of correct responses higher than 70% and a mean combined score higher than 1.50. On the contrary, a few items were considered very difficult because they generated a percentage of correct responses lower than 30% and a mean combined score lower than –1.0. These difficult items included *jump, cross, drop,* and *leave* for the translation task and *see* for the multiple-choice task. Compared with the control condition, the cue of semantic frames generated slightly lower scores for items *count, throw, drop,* and *leave* in the translation task and for items *kick, cross, count, throw,* and *see* in the multiple-choice task. These items may be the ones for which the cue of semantic frames was not very effective, compared with the no-cue condition.

Discussion

Unlike what was found in Experiment 1, the results from Experiment 2 confirmed a significantly better effect of semantic frame cues than the no-cue condition. Apparently, the new cues, which contained a definition of the frame and a cueing verb, worked better than the old ones, which presented only a cueing verb embedded in a sentence. It seemed that students were able to tackle the meaning of an unfamiliar sense by using the description of the underlying concept along with a word that evoked the target semantic frame. Both lexical access and conceptual processing were indeed called for when the participants read the new cues. This inclination implies that, for the semantic frame cue to succeed, the participants need to use both word association and conceptual mediation.

However, compared with the elaborated context cue, the semantic frame cue only produced moderate effects. For particular items, the semantic frame cue was

not very helpful. Several reasons may account for such moderate effects. First, the participants seemed to be better at using word association rather than conceptual mediation in understanding the unfamiliar senses. As evidenced in their translation responses to certain difficult items (e.g., *cross, drop, leave,* and *jump*), students tended to use the core sense or the senses they were familiar with to interpret the tested sense without paying much attention to the cue. That is, students relied on the L1 translation of the core sense or another sense as a major resource to guess the target meaning. They were still unable to make full use of L2 cues to directly access the word concepts.

Second, the tendency of processing cues at the semantic rather than conceptual level frequently contributed to the participants' inconsistent performance in the two tasks. For example, for the item *run,* a lot more participants scored correctly in the translation task than in the multiple-choice task. These participants, when translating the target sense of *run* into *tùn-sè*, focused on the meaning dimension of "color fading" rather than "color spreading" dispite that the latter meaning dimension was actually hinted in the cue. Another example is *see.* Once students had translated the target sense of "accompany" as *mù-sòng* (to watch somebody leave), the Chinese lemmas took the control of their thinking and prevented them from accessing the correct L2 concept cued by the definition of the semantic frame.

Indeed, the L1 translation equivalents were found to create both positive and negative effects on learners' comprehension of L2 polysemy. Its influence mainly depended on the degree of similarity between L1 and L2 concepts. If the L1 and L2 concepts overlapped to a great extent for an item, the item tended to elicit more correct responses. For example, to understand the metaphorical meaning of *knock* as "to criticize" (i.e., *pēng-jí*), participants only needed small extensions from the translation equivalent of the core sense (i.e., *dǎ-jí*). Other items with similar polysemous readings in both English and Chinese were the target senses of *steal* (*tōu-tōu-jìn-rù,* to walk into some place stealthily)*, swim* (*ióu-zǒu*, to move in an indefinite way)*,* and *fail* (*shī-wàng*, to disappoint someone)*.* On the other hand, learners' L1 may cause negative effects by blocking students from getting the correct meaning of the target senses because the concept evoked by L1 translations

overrode the L2 concept induced by the cue. Two prominent examples are *run* and *see,* for which L1 conceptual transfer may have caused limited comprehension of the target L2 concept (Palvenko, 1999).

General Discussion and Conclusion

This study examined the effects of semantic frame cues on the access of word concepts underlying English polysemous verbs. The results of Experiment 2 confirmed the positive effects of semantic frames in promoting learners' understanding of unfamiliar senses. Such results highlighted the important role of lexical access and conceptual processing in word sense comprehension. Nonetheless, the cue effect was found moderate due to learners' over-reliance on L1 word associations in accessing L2 concepts, the processing of cues at the semantic rather than conceptual level, and different degrees of overlap in concepts activated by L1 and L2 words.

Generally speaking, the high-intermediate learners in this study were a step short from using conceptual mediation to process English lexicon. As pointed out by Basden, Bonilla-Meeks, and Basden (1994), conceptual mediation has to result from learners' daily encounter with L2 words and their referents. At the early stage of L2 learning, learners elicit underlying concepts common in L1 and L2. Only through the continued use of L2 can they gradually develop an indirect link between L1 and L2 words. Such a phenomenon represents conceptual transfer in which L1-based concepts are attached to L2 word meanings (Palvenko, 1999). However, some researchers warned that translation equivalents with different semantic constraints tend to activate distinct conceptual representations, especially for polysemous words (Paradis, 1997). For L2 learners who acquire the target language in classroom settings, the mental representation of L2 word concepts is impoverished because they "don't have enough context to form an experiential multi-modal representation which goes beyond the word definition and forms a concept" (Palvenko, 1999, p. 222).

Having applied the proposal of Frame Semantics to disambiguating L2 polysemy, the current study marked an empirical attempt to investigate how semantic frames could be used to understand L2 word meanings. As demonstrated

here, learners were able to activate the background frames to interpret unfamiliar senses, indicating a promising future wherein they adopt semantic frames to learn L2 words. However, the study posed a question about whether L1 or L2 frames or the combination of these two was actually evoked in processing L2 word meanings. Further research is needed to see how L2 learners can activate the desired semantic frames and how L1 and L2 frames interact in the process of frame invoking and evoking.

For educational implications, accessing the underlying word concept seems a useful strategy for acquiring L2 polysemy. Although the cue of elaborated context was proved to be the most successful in the current study, some polysemous items were unable to be disambiguated through contextual information. Instead, they were successfully comprehended through the semantic frame cue. Therefore, semantic frames can be used as an effective tool for understanding L2 word meanings. For senses that are closely related to the core sense, attributing to the word concept helps learners understand the senses easily and notice the slight shifts in meaning. In addition, the underlying concept allows learners to treat every occurrence of the word as a repetition of what has been previously taught so that they can build on existing knowledge (Nation, 2001).

Pedagogically, teachers should emphasize the underlying concept that connects a newly introduced sense with learners' known senses. Rather than having students learn word senses in a discrete way, teachers can use semantic frames to help students establish a conceptual network among senses. To better grasp the word concept, learners should be encouraged to use monolingual dictionaries as often as possible so as to reduce their reliance on L1 translations. Through constant exposure to L2 words in context and understanding of word concepts, learners can then achieve a higher level of word meaning comprehension.

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Appendix A: Semantic Frame Cues Used in Experiment 1

Item	Tested Sense	Frame	Cue
bring	She could not bring herself to talk about her childhood.	Force	The gunman forced us into the room.
burn	The girl's father burned to know the reason.	Heat	The Queen desires that you come at once.
buy	I don't really buy into his ideas.	Coming_to_believe	She realized that he did not care about her at all.
carry	She always carried herself like a queen.	Posture	He sits with crossed legs.
dance	The words on the computer danced before her eyes.	Self-motion	The birds are flying across the river.
drop	The high land drops toward the sea.	Path_shape	The river reaches the lake here.
fix	They were going to fix the man breakfast.	Food_preparation	I'm boiling the baby's milk.
jump	They suddenly jumped us from behind.	Self-motion	The soldiers marched along the road.
leave	Don't leave your truck near the park.	Placing	Please place forks and knives on the table and get ready for dinner.
lose	Tim might have lost himself in his work.	Placing	She was so engaged in practicing the piano that she forgot to eat lunch.
run	The colors on his shirt had run.	Placing	He piled the boxes one on top of the other so that they were not all over the room.
see	I will see you to the door.	Cotheme	The boys were chasing the dog around the corner.
send	It is the music that sends us, not the words.	Experiencer_obj.	The teachers were very impressed with your exam scores.
stand	Confucius' words have stood the test of time.	Duration	The hot weather lasted for five months – from May till October.
steal	He had to steal into the kitchen.	Self-motion	We can walk for thirty minutes, and then jog for another thirty minutes.

swim	The words on the page are swimming before my eyes.	Self-motion	She hurried across the road to take the bus.
throw	They're going to throw a dinner party this Saturday.	Schedule	Next year China will host the Olympic Games in Beijing.
wear	The old building has worn very badly.	Change_of_ quality	The rocks have eroded because of strong wind and rain.

Appendix B: Semantic Frame Cues Used in Experiment 2

Item	Tested Sense	Frame	Cue
bend	We can bend the rules just this once.	Compliance	Someone's behavior is or is not in agreement with certain rules. For example, *John violated the laws by not paying taxes.*
bring	She could not bring herself to talk about her childhood.	Force	Someone makes another person do something that is unpleasant to that person. For example, *The gunman forced us into the room.*
buy	I'm not prepared to buy his ideas.	Coming_to_ believe	A person comes to believe something after thinking it over. For example, *We concluded from the report that the new method is better than the old one.*
carry	She always carried herself like a queen.	Posture	Somebody holds his body parts in a certain way. For example, *He sits with crossed legs.*
count	Her apology counted for nothing with him.	Social_ behavior_ evaluation	A certain behavior is judged based on some social standards. For example, *The color of our skin does not matter in the organization.*

cross	If you cross him, you're finished.	Experiencer_obj.	Something causes somebody to have a particular emotion. For example, *The bad news upset the people in the company.*
drop	The high land drops toward the sea.	Path-shape	The shape of a place determines the path a person takes to travel over that place. For example, *I'll meet you where First Street crosses East Road.*
fail	He feels he has failed his family.	Experiencer_obj.	Something causes somebody to have a certain kind of feeling. For example, *Her son's dishonest behavior had shamed her.*
fix	They were fixing the poor man breakfast.	Cooking_creation	Someone prepares something for others to eat or drink. For example, *I'm baking a cake for the children.*
hit	The meaning of the event hit me.	Becoming_aware	A person becomes aware of something. For example, *We noticed that Jenny was wearing a new dress today.*
jump	They suddenly jumped us from behind.	Physical_attack	Someone physically hurts another person with something. For example, *A few young men assaulted an old lady and hurt her seriously.*
kick	You'll kick yourself when I tell you the answer.	Experiencer_obj.	Something causes somebody to have a certain kind of feeling. For example, *The loud music in the midnight disturbed people in the neighborhood.*

knock	The newspapers started to knock the England team.	Judgment_ Communicati on	Someone expresses his positive or negative judgment of another person. For example, *Mother will scold us for breaking the expensive lamp.*
leave	He went away, and left me to make decisions alone.	Abandonment	Someone let another person do things on his own without offering support. For example, *She was abandoned by her parents when she was born; her aunt then raised her.*
lend	The park lends itself well to summer camping.	Suitability	Something is judged as being right for a particular purpose. For example, *Her experience and abilities fit her for the job.*
pick	Yesterday Peter picked a fight with a waiter in the restaurant.	Activity_start	Someone begins an activity at a certain place and time. For example, *We will begin the celebration at ten o'clock in that building.*
run	The colors ran over the new shirt.	Placing	Something or someone causes other things to move to another place. For example, *The milk was spread all over the table.*
see	I will see you to the door.	Cotheme	Two people or two objects move to the same place. For example, *The boys were chasing the dog around the corner.*

send	It is the music that sends us, not the words.	Experiencer_obj.	Something causes somebody to have a particular emotion. For example, *Linda's high scores in the exam impressed her teachers.*
shoot	The man shot a hand across the table.	Body_movement	A person moves or does something using some part of his body. For example, *She waved her hand when she left.*
steal	He had to steal into the kitchen.	Self-motion	A person moves to a place in a particular way. For example, *We can walk for thirty minutes, and then jog for another thirty minutes.*
swim	The words on the page are swimming before my eyes.	Self-motion	Something or someone moves to a place in a particular way. For example, *She hurried across the road to take the bus.*
throw	The question threw him for a moment.	Experiencer_obj.	Something causes somebody to have a particular feeling. For example, *It embarrassed him that he didn't know what was going on.*
wash	Jim's story didn't wash with me.	Certainty	Someone is certain or uncertain about the correctness of his beliefs. For example, *We doubt whether the theory is the best.*