

A Comparison of Using Three Different Types of Cues, Elaborated Context, Semantic Frames and Meaning Chains, in Disambiguating Polysemous Verbs

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Abstract

As polysemy is encountered frequently in English as foreign language learning, FL learners' ability to disambiguate polysemous verbs becomes critical to their comprehension in the target language. This thesis, accordingly, investigated how Iranian EFL learners achieved comprehension of English polysemous verbs by using three different types of cues: (1) elaborated context, (2) semantic frames, and (3) meaning chains. Participants were 49 university students in Zahedan who were randomly assigned to four conditions, the three cue conditions and a control no-cue condition. After reading the cues, participants completed a translation and a multiple-choice task and rated their confidence in their answers. The Results indicated that when only accuracy was taken into account and when accuracy and confidence ratings were jointly examined, only the elaborated context cue elicited significantly better performance than the control condition as measured in the multiple-choice task. As for the translation task, none of the three experimental cues generated significantly better results than the no-cue condition.

Keywords: Polysemy, Elaborated Context, Semantic Frame Meaning Chain

1. Introduction

To fill the gap of previous research and to contribute to the acquisition of L2 polysemy, the current project focused on L2 learners' comprehension of polysemous words in sentence processing. It examined how Iranian EFL learners processed English polysemous words by undertaking different types of tasks and how they achieved different degrees of comprehension under the influence of tasks. These tasks included different types of cues theorized to help disambiguate polysemous senses and tests for measuring learners' knowledge of unfamiliar senses. It was hoped that the results of this investigation would shed light on how EFL learners understand polysemy and provide insights on how the learning of polysemous senses may occur and may be improved.

Three types of cues were examined: (1) elaborated context with richer contextual information, (2) semantic frames calling for the concept of the target word, and (3) meaning chains composed of related English senses. Two tasks, a translation task followed by a multiple-choice task, were used to measure learners' understanding of the tested unfamiliar senses. Participants' self-ratings on their confidence with the task performance were incorporated into the task design.

1.2 Research Questions

1. How do Iranian EFL learners disambiguate unfamiliar senses of English polysemous verbs that are embedded in a sentential context using different types of cues, (elaborated context, semantic frames, meaning chains and no cues as a control), as measured by the accuracy of answers to the tasks and self-ratings of confidence?
2. How did the learners perform differently in the two tasks of translation and multiple-choice questions?

1.3 Rationale for Three Types of Cues

The rationale for selecting the three types of cues is based on theories of how senses of a polysemous word are related and research of how unfamiliar words are learned. The first type of cue was an elaborated context. It consisted of two sentences that set the stage for processing the target sentence with the tested sense. Because the target sentence only provided limited context for the tested sense, this type of cue presented a richer context for disambiguating the target sense. For example, the target sentence for *swim* as "appearing to whirl before one's eyes" is *The words on the page are swimming before my eyes*. The elaborated context cue is *My headache started two hours ago. Now it is getting worse while I am reading the book*.

How will an elaborated context aid the comprehension of unfamiliar senses? In L1 research, context has played a major role in solving the ambiguity caused by polysemous words. Context helps language users select the appropriate meaning even when multiple meanings are initially accessed (Swinney, 1979; Tabossi, 1988; Williams, 1992). In L2 vocabulary acquisition, learning word meanings from context has been promoted as a useful strategy. Learners are encouraged to guess the meaning of unknown words using both the discourse

situation involving the words and the word's lexical structure as semantic information is usually inherent in the word itself (Elley, 1991; Hatch & Brown, 1995). Applying the above arguments to the processing of polysemy, it seems that an appropriate context is sufficient to resolve word sense ambiguity of polysemous words. However, due to L2 learners' low rate of successful guesses, the effectiveness of guessing word meaning from context is yet to be decided. Other factors, such as learners' vocabulary knowledge, the availability of contextual clues, and learners' use of appropriate guessing strategies, also influence the success of inducing word meanings from context (Haynes, 1993; Laufer, 2001). Therefore, the power of context remains to be tested.

The second condition used the cue of semantic frames. The cue consisted of an English sentence with a verb that shares the same semantic frame to which the target sense belongs. It was hoped that the sentence would trigger the shared background frame so as to aid the comprehension of the tested sense. In the design of the cue, first, the semantic frame to which a target sense belongs was identified. For instance, the target sentence for *swim* as "appearing to whirl before one's eyes" belongs to the frame of Self-motion, which is defined as "a living being, the Self-mover, moves under its own power in a directed fashion" (Johnson, Fillmore, Petruck, Baker, Ellsworth & Ruppenhofer, 2002). Such a frame may contain the frame elements of Area (i.e., a general area in which motion takes place), Distance (i.e., the extent of motion), Duration (i.e., the amount of time for which a state holds), Event, Goal (i.e., where the Self-mover ends up as a result of the motion), Path (i.e., a trajectory of motion which is neither a Source nor a Goal), Purpose (i.e., the purpose for which a Self-mover moves), Result (i.e., the result of an event), Self-mover (i.e., the living being which moves under its own power), Source (i.e., a definite starting-point of motion), and Speed (i.e., the rate at which the location of the Self-mover changes with respect to time) (Johnson et al., 2002). In the target sentence *The words on the page are swimming before my eyes*, *The words* is the Self-mover, realized as an NP. The target word is *swimming*, while *before my eyes* expresses an Area and is realized as a PP. The next step was to select a verb from a pool of lexemes under the particular semantic frame and to construct a sentence with the selected verb. For the above sense of *swim*, the verb *hurry* was chosen to form a sentence that could cue the target sense of *swim*. Therefore, the cue was designed as *She hurried across the road to take the bus*. Here, the NP *She* is the Self-mover, *hurried* is the target word, the PP *across the road* represents the frame element of Path, and the PP *to take the bus* expresses Purpose.

A semantic frame cue is theorized to help the comprehension of polysemous words because word senses are related through their links to common background frames, as suggested in frame semantics (Fillmore & Atkins, 1992). When trying to make sense of a text, the hearer/reader invokes background frames 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). Based on the above arguments, the cueing verb in the semantic frame condition works to evoke the shared frame that may lead to the understanding of the tested sense. However, empirical studies on L1 speakers' use of semantic frames in accessing word meanings are rare, not to mention studies on the processing or learning of L2 vocabulary. As L2 research has suggested a developmental process from lexical to conceptual

processing with an increase in L2 proficiency (e.g., Jiang, 2000; Kroll & de Groot, 1997; Kroll & Stewart, 1994), intermediate learners in this study may be able to access the underlying concepts, or background frames, of L2 words. Consequently, this study sought to test the applicability of semantic frames in disambiguating L2 polysemous words.

The third condition used meaning chains as the cue. Here, the cue consisted of two or three sentences with one representing the core sense of the target polysemous word and the others a sense connecting the core sense and the target sense. The mediating sense was considered somehow familiar to the participants. To ensure that students understand this sense, additional context was provided for disambiguating the mediating sense. Again, take the target sense of *swim* as “appearing to whirl before one’s eyes” as an example. The meaning chain cue is composed of two sentences: (a) *I learned to swim when I was ten*, in which *swim* has 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?* with a mediating sense of “being immersed in or covered with liquid.”

The rationale for this type of cue comes from the meaning chain model indicating that learners’ understanding of unknown senses could be obtained by drawing analogies from the senses they previously knew. Regarding the representations of multiple senses of a polysemous word, a group of researchers advocated a single-sense view by treating polysemy as coming from small extensions of existing meanings (Nunberg, 1979; Ruhl, 1989; Clark, 1993; Murphy, 1997). The meaning chain model thus suggests that within the family resemblance categories, meaning relations exist between adjacent members. The central member, i.e., the prototypical sense, shares a maximal number of attributes with other members and serves as a reference point from which the related meaning can be extended (Taylor, 1995; Cuyckens & Zawada, 1997). It is accordingly reasonable to hypothesize that by exercising analogy, learners may be able to process unfamiliar or novel senses through meaning chains. As L2 learners tend to be most familiar with the sense they first acquired, such a prototypical sense may serve as a useful resource for acquiring other senses. Therefore, this experiment attempted to test to what extent the meaning chain model could be applied to L2 learners’ comprehension of polysemous words.

2. Method

2.1 Participants

Participants for this experiment were 49 English-major sophomores at a university in Zahedan, Iran. Eight of them participated in a think-aloud or interview session. All of the participants had a similar background in learning English. They could be categorized as high-intermediate learners of English in terms of their vocabulary knowledge and overall English proficiency.

2.2 Instruments

For each item, one sentence containing the tested sense was first created. Then a multiple-choice question was designed to assess learners’ understanding of the target sense. The entire set consisted of a translation task and a multiple-choice task. The translation task

had a sentence with the tested word underlined and a 5-point Likert scale for confidence ratings. The multiple-choice task contained a sentence with the tested sense, a multiple-choice question, and a 5-point Likert scale for confidence ratings. The second set of instruments was composed of cues in four conditions: (1) elaborated context, (2) semantic frames, (3) meaning chains, and (4) the control condition with no cues provided. The design and rationale for each condition are described under the next subheading.

The above two sets of materials were combined and typed on 8×3.5 inch paper to form a booklet. Each booklet contained 18 test items with each item having a particular type of cue on the first sheet, the translation task on the second, and the multiple-choice task on the third (Please refer to Appendix for an example item). In addition, a set of practice trials was created for each type of cue. The four items of practice trials were also typed on a booklet similar to that for the test items. The only difference is that for the first two items, the practice booklet had a fourth sheet listing the correct answers to the two tasks and a Farsi explanation of how to derive the answers from the cue. The Farsi explanation was intended to guide students in processing the cue. For the third and fourth practice items, only correct answers, without explanations, were provided on the fourth sheet. The purpose of such a design was to familiarize participants with the test procedure and lead them step-by-step into the real test.

2.3 Procedure

All participants, except eight for the think-aloud or interview session, took the test simultaneously in their regular classroom. Ten students were randomly assigned to each of the three experimental conditions, and the other eleven to the control condition. Each participant was first distributed a booklet with four practice items. They read the test instructions on the cover sheet of the booklet and worked on the items at their own pace. They were continuously reminded not to turn the test sheets back and forth. It took 10 minutes for students to finish the practice trials. Each individual then received a booklet of 18 test items. They worked in the same way as they did in the practice trials and wrote down their answers in the booklet. Students were given sufficient time to finish the test. The entire test took approximately 45 minutes.

Eight randomly selected participants for the think-aloud or interview session took the test one by one in another classroom. Two were randomly assigned to each of the four conditions. The first two participants did think-aloud while taking the test, but they seemed unable to say aloud their thoughts and thus did not provide useful accounts for their test-taking process. So they were interviewed right after their think-aloud. The interview method was then used for the rest of the participants. During the interview session, I asked the students to read the test directions prior to doing the tasks. After they finished each item, I stopped them and asked them to reflect what they were thinking about when they worked on the item. The interview focused on how they figured out the meaning of the target sense, how they used the cues as help, and how they came up with their answers for the two tasks. Due to time constraints, each participant in the three experimental conditions was interviewed for half of the total number of items, with one of the two participants in the same condition covering the first half of items and the other the second half. As for the two participants in the control condition,

they were interviewed for the whole set of items. Each interview session lasted about 30 to 40 minutes. After the interview, the students finished the rest of the items individually without my interruption. The interviews were conducted in Farsi, but students were free to respond in English.

2.4 Data Analysis

As a between-subject design, this experiment has the four cue conditions as the independent variable, and the performance in the two tasks as the dependent variable. First, students' booklets were collected, with each answer scored and each confidence rating recorded. The proportion of items answered correctly in each condition was calculated respectively for the two tasks. The mean percentage for the multiple-choice task was adjusted for guessing. To determine the effects of different types of cues, planned comparisons were carried out to compare the mean percentage of participants who answered each item correctly in each condition. To calculate the confidence rating scores, the number circled in the scale was assigned as the score for a particular item, regardless the accuracy of answers. However, the overall confidence scores for correct and incorrect answers in each of the two tasks were counted separately. The mean confidence scores in each condition were then obtained and used to compare the differences in confidence ratings among conditions. One-way ANOVA's (analysis of variance) were employed to generate the results of the above comparisons.

An alternative scoring method was applied with the purpose of combining accuracy of answers and students' confidence ratings. First, a score identical to an individual's confidence rating was assigned to each correct answer. Second, a score with a negative sign identical to the student's confidence rating was assigned to each incorrect answer. For example, if Participant 1 answered the translation task of Item 1 correctly and rated his/her confidence as 3, then he/she got a score of 3 for the translation task of Item 1. If the participant answered the multiple-choice task of Item 1 incorrectly and rated his/her confidence as 3, then he/she got a score of -3 for the multiple-choice task of Item 1. The score each student received for each item was then summed to obtain a final score for the student. One-way ANOVA's were used to compare students' performance of the two tasks in the four conditions.

To achieve the second purpose of Experiment 2, that is, to detect possible problems with the task design, participants' performance in the two tasks of translation and multiple-choice was compared within conditions. For each condition, four types of statistics were generated, including the percentages of participants who answered both tasks correctly, who answered both tasks incorrectly, who answered correctly in translation but incorrectly in multiple-choice, and who answered correctly in multiple-choice but incorrectly in translation. Such a comparison provided a clue for how well the two tasks were designed and how each cue condition worked in affecting students' performance. Another important purpose of this experiment was to examine the design of cues for each item. Therefore, each item was analyzed by comparing two statistics in each condition: the percentage of participants who answered the item correctly and the mean combined score. These two statistics were obtained by combining the performance in both tasks. Such an analysis provided a clear picture of the degree of difficulty of each item. Because the qualitative data were mainly used for detecting

possible problems in the design of cues and tasks, what was transcribed and analyzed centered on three themes: (1) how students processed cues in the four conditions, (2) how they figured out the meaning of the tested senses, and (3) what problems they encountered in the test process.

3. Research Question 1

3.1 Proportion of Items Answered Correctly

To answer the first research question of how each type of cue affected learners' processing of unfamiliar senses, the results of accuracy of answers are first presented. Table 1 shows the proportion of items answered correctly in the two tasks. The first panel lists the descriptive statistics of each condition. After the correction of guessing for the multiple-choice results, the means for the two tasks were close to each other in Conditions A and B. A large mean difference, however, was found in Condition C and the control condition. It seems that participants had roughly equal performance on the two tasks when they received the cue of either elaborated context or semantic frames. By contrast, participants in the meaning chain and control conditions had higher mean scores in translation than in the multiple-choice task. In both tasks, Condition A had the highest mean, whereas Condition C the lowest. Indeed, the second panel of the table indicates that Condition A was significantly better than the control condition in the multiple-choice task. For the translation task, there were no significant differences among any of the experimental conditions and the control condition. Similarly, the overall *F* test reached a significant level of .05 only in the multiple-choice task.

Table 1. *Proportion of Items Answered Correctly in Two Tasks*

Condition	Translation		Multiple-choice	
	M	SD	M	SD
A (elaborated context) (N=12)	.59	.09	.62	.19
B (semantic frames) (N=12)	.47	.16	.47	.25
C (meaning chains) (N=12)	.49	.13	.38	.16
D (control) (N=13)	0.54	.14	.44	0.20
Comparisons of conditions	Translation		Multiple-choice	
A against D	F=.75	p=.391	F=3.29	P=.029*
B against D	F=1.81	p=.185	F=0.13	P=.725
C against D	F=.88	P=353	F=0.65	P=424
Overall	F=1.89	p=145	F=3.29	P=029*

Note. * $p < .05$.

3.2 Confidence Ratings

The results of confidence ratings also help to see the effects of cues on students' performance. The confidence ratings for correct and incorrect answers were calculated separately. As

shown in the first panel of Table 2, the mean ratings for correct answers were higher than those for incorrect answers across conditions. In terms of correct answers, the means for the two tasks in each condition were close to each other. In contrast, for incorrect answers, the mean for the multiple-choice task in each condition was higher than its counterpart for the translation task. These results seemed to suggest that first, students generally had a higher level of confidence when they actually answered correctly; they were less confident with the answers that eventually proved to be wrong. Second, they appeared to be equally confident in the accuracy of their answers to the two tasks, but for those items they missed, they were less confident in the performance on translation than on multiple-choice. It implied a higher level of difficulty of the translation task, especially when the items were challenging.

Table 2. *Planned Comparisons of Confidence Ratings Between Conditions*

Condition	Translation				Multiple-choice			
	Correct		Incorrect		Correct		Incorrect	
	M	SD	M	SD	M	SD	M	SD
A (elaborated context) (N=12)	3.72	.56	2.92	.93	3.74	.48	3.18	.64
B (semantic frames) (N=12)	3.85	.67	2.89	.58	3.80	.55	3.33	.48
C (meaning chains) (N=12)	3.37	.55	2.98	.76	3.37	.42	3.10	.48
D (control) (N=13)	3.1	.37	2.61	.62	3.24	.50	2.91	.68
Comparisons of conditions	Translation				Multiple-choice			
	Correct		Incorrect		Correct		Incorrect	
	F	P	F	P	F	P	F	P
A against D	6.69	.012*	3.46	.067	10.63	.002*	2.40	.126
B against D	14.54	.000*	1.02	.316	13.39	.000*	3.03	.086
C against D	.71	.403	3.79	.056	1.59	.212	.71	.403
Overall	5.89	.000*	1.65	.186	5.92	.000*	1.26	.294

Note. * $p < .05$.

The second panel of Table 2 illustrates the comparisons between experimental and control conditions. The overall F test was significant for correct answers but not for incorrect answers. In the category of correct answers, participants in Conditions A and B had significantly higher confidence ratings than those in the control condition. Therefore, compared with participants in the control condition, those who received cues A or B, but not cue C, were more confident that their answers were correct. Such a pattern was found across tasks. But as far as incorrect answers are concerned, respondents in none of the experimental conditions rated their confidence significantly higher than those in the control condition. These insignificant results were observed in both tasks, suggesting that for difficult items that induced inaccurate responses, students' confidence with their answers was equally low across

conditions and tasks.

3.3 Combined Scores of Accuracy and Confidence Ratings

Another way to compare cue effects is to examine jointly students' performance in accuracy and confidence ratings. The mean scores obtained by combining these two measures are listed in Table 3. Note that the way of calculating the combined scores may generate a score of negative points for a particular respondent. That is why some of the means were low. The lowest means appeared in Condition C of both tasks, even lower than those of the control condition. Condition A had the highest means, while the mean of Condition B for the translation task was lower than that of Condition D and the mean for the multiple-choice task higher than that of Condition D. However, the planned comparisons identified significant differences only in Condition A against D for the multiple-choice task. As for the translation task, participants did not perform significantly differently in the experimental and control conditions.

These results converged with those listed in Table 1 where only accuracy of answers is concerned. Overall, Condition A seemed most helpful in students' comprehension of polysemous words as measured in the multiple-choice task. The other two experimental conditions, however, did not generate significantly better results than the control condition in either task. What is worth noting is that participants in Condition C generally had poorer performance than those in the control condition, though the differences were not statistically significant. Participants in Condition B, on the other hand, tended to outperform those in the control condition in the multiple-choice task whereas the reverse pattern occurred in the translation task.

Table 3. Participants' Performance on Two Tasks: Combining Accuracy and Confidence Ratings

Condition	Translation		Multiple-choice	
	M	SD	M	SD
A (elaborated context) (N=12)	17.75	12.44	.32.08	20.02
B (semantic frames) (N=12)	5.00	18.11	17.25	23.53
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
Comparisons of conditions	Translation		Multiple-choice	
A against D	F=1.65	p=.205	F=7.07	P=.011*
B against D	F=0.41	p=.527	F=.49	P=.486
C against D	F=1.06	P=.310	F=.58	P=.452
Overall	F=1.97	p=.132	F=4.15	P=.011*

Note. * $p < .05$.

4. Research Question 2

4.1 Conditional Probability of Tasks

One of the research questions for the two experiments concerns the design of tasks. To examine the task design, the conditional probability of the two tasks in each condition is plotted in Table 4. If two tasks are consistent in measuring the same ability, high scores should fall in the cell of correctness for both tasks and the cell of incorrectness for both tasks. The lowest score should appear in the cell crossing Translation-Correct and Multiple-choice-Incorrect because the multiple-choice task is likely to elicit more accurate answers and it seems unusual for a person to provide a correct translation but a wrong choice in the multiple-choice question. On the contrary, it seems natural for a respondent to fail in the translation task but succeed in the multiple-choice task. So the score in the cell crossing Translation-Incorrect and Multiple-choice-Correct should be higher than that crossing the Translation-Correct and Multiple-choice-Incorrect.

Table 4 shows that in all conditions, the highest score in each condition fell in the cell of Translation-Correct and Multiple-choice-Correct whereas the lowest score in the cell of Translation-Correct and Multiple-choice-Incorrect. In addition, the score of Translation-Incorrect crossing Multiple-choice-Correct was higher than that of Translation-Correct crossing Multiple-choice-Incorrect. However, the percentages in the four cells of Condition C were close to each other, suggesting that this condition did not seem to work well in distinguishing the performance. The quantitative analysis up to now has disclosed the weakness of Condition C as it generated a poorer, though not statistically significant, performance than the control condition. Some of the problems with this type of cue are also manifested in the analysis of qualitative data.

Table 4. *Comparison of Participants' Performance in Two Tasks*

Condition A	Multiple-choice	
Translation	Correct	Incorrect
Correct	47.7%	11.1%
Incorrect	24.1%	17.1
Condition B	Multiple-choice	
Translation	Correct	Incorrect
Correct	41.4%	12.8%
Incorrect	16.7%	29.1%
Condition C	Multiple-choice	
Translation	Correct	Incorrect
Correct	31.0%	18.1 %
Incorrect	22.2 %	28.7 %
Condition D	Multiple-choice	
Translation	Correct	Incorrect
Correct	41.4 %	12.8 %
Incorrect	16.7 %	29.1 %
All conditions	Multiple-choice	
Translation	Correct	Incorrect
Correct	38.9 %	13.3 %
Incorrect	21.9 %	25.9 %

Note. The number in each cell represents the percentage of participants.

4.2 Item Analysis

Other than testing the effects of different types of cues, Experiment 2 also aimed to select items that have enough power to distinguish students' performance in the experimental and control conditions. An item analysis was accordingly carried out to compare students' performance on each item in the four conditions. Table 5 illustrates the overall performance of the two tasks by listing the percentage of participants who provided accurate answers and the mean combined score for each item.

Table 5. *Participants' Performance on Each Item*

Item	Condition A: Elaborated context		Condition B: Semantic frames		Condition C: Meaning chains		Condition D: No cues	
	POP	MCS	POP	MCS	POP	MCS	POP	MCS
bring	50.00	0.21	62.50	1.29	50.00	0.00	61.54	0.61
burn	75.00	2.67	83.33	2.63	70.83	1.63	84.62	2.38
buy	62.50	0.75	16.67	-2.33	37.50	-0.46	42.31	-0.61
carry	25.00	-2.21	50.00	0.79	29.17	-1.37	34.62	-1.04
dance	91.67	3.37	75.00	1.63	87.50	2.71	80.77	2.04
drop	33.33	-0.83	12.50	-2.13	29.17	-1.33	3.85	-2.19
fix	79.17	1.87	54.17	0.37	33.33	-0.83	50.00	00.42
jump	29.17	1.21	12.50	-2.37	20.83	-1.87	15.38	-1.87
leave	95.83	3.87	70.83	2.17	70.83	1.21	80.77	2.38
lose	83.33	2.54	79.17	2.79	66.67	0.83	80.77	2.04
run	87.50	2.92	54.17	1.87	62.50	0.83	76.92	1.46
send	54.17	0.58	54.17	0.92	45.83	0.00	53.85	0.46
see	50.00	0.79	25.00	-1.50	29.17	-1.04	30.77	-0.88
stand	58.33	1.17	50.00	0.54	45.83	-0.21	46.15	0.15
steal	83.33	2.92	54.17	0.21	50.00	0.04	57.69	0.50
swim	62.50	1.04	45.83	-0.25	66.67	1.33	57.69	0.61
throw	95.83	3.46	75.00	2.46	50.00	0.83	84.62	2.61
wear	58.33	1.00	87.50	3.54	75.00	1.92	69.23	1.35

Note. POP: the percentage of participants who answered the item correctly; MCS: the mean combined score.

Several items stand out as particularly difficult because of their low scores in the two columns of statistics, for example, *buy*, *carry*, *see*, *jump*, *stand*, and *drop*. These items have

less than or close to 50% of participants who answered correctly and a mean combined score lower than or close to 1 across four conditions. These items may be highly unfamiliar to the respondents.

5. Qualitative Results

The main purpose of incorporating a qualitative method was to complement what could not be detected from quantitative results, particularly in the design of cues and tasks. Consequently, the qualitative data analysis focused on three themes: the comprehension processes, the effectiveness of cues, and the task design. For ease of discussion, the eight students participating in the think-aloud and interview sessions were labeled as A1 and A2 in Condition A, B1 and B2 in Condition B, C1 and C2 in Condition C, and D1 and D2 in Condition D.

5.1 Comprehension Processes

Regarding the access of word meanings, participants typically reported that they thought of the core sense of the target polysemous word first while reading the target sentence. If the core sense did not fit, they searched for other senses they knew. If no other senses were available except the core sense, participants examined the sentential context again and provided a translation they thought most appropriate. But there were exceptions. If students figured out a meaning for the tested sense through their correct understanding of the cue and such a meaning fit into the target sentence just right, they reported a tendency to skip the core sense and access the target sense directly (e.g., *throw* for A1, *fix*, *lose*, *stand* for B2). Note that a necessary condition for such a way of meaning access was a correct understanding of the cue. Students' misunderstanding of cues or inaccurate knowledge of the senses they thought they knew often resulted in comprehension failure (e.g., *see*, *steal* for D1, *buy* for D2). However, in some cases, even if the cue worked, a few participants (e.g., A2, B1, B2) still consulted the core sense or the senses they knew to verify their guessing. Therefore, the core sense, or learners' most familiar sense for a polysemous word, was revealed as the most accessible resource when dealing with unfamiliar word senses.

Another common phenomenon found in the participants' self-report was the use of Farsi. These participants used their L1 very frequently to understand the meaning of English words. Sometimes the Farsi translation equivalent they provided for the unknown sense misled them. For example, the participant B1 translated the "dissolving and spreading" sense of *محو شدن* رنگ از طریق پخش شدن, which was counted as a correct translation. But such a Farsi translation, also polysemous itself, can be interpreted as "color fading," which is close to the choice "not as white as before" in the multiple-choice question. Not surprisingly, B1 chose this interpretation and missed the multiple-choice, though her translation was scored as correct. The strategy of using the L1 to interpret the cueing verbs sometimes led to accuracy (e.g., *fix*, *leave*, *lose* for B2), but in other cases, it failed (e.g., *stand*, *fix* for B2). An over-reliance on the L1 was especially a disadvantage for participants in the meaning chain condition. They failed to see the connections among the cueing and target senses because they tended to use Persian translations to understand the meanings of different senses in the chain, rather than attribute the meaning variation to a general underlying concept. The dramatic changes in

Persian translated lemmas for different senses also prevented them from seeing the logic of the chaining sequence. These may be the major reasons why the meaning chain cue did not aid the comprehension; what was worse is that for some items the cue actually created negative effects.

Concerning the test-taking strategies, some students tended to be confident with the meaning they had figured out so as to ignore other possibilities in the multiple-choice question (e.g., *swim, run* for B1). Students who had learned many of the target senses (e.g., *dance, steal, throw, fix, leave, lose, wear* for D1) were able to use other words in the sentence or the grammatical structure as clues to guess correctly the meaning of the target sense without the help of any preceding cues. So no matter how limited the context of the target sentence was designed, it still provided some sort of clues for learners who were good at guessing word meanings from context.

5.2 Effectiveness of Cues

Compared with other cue types, the elaborated context seemed most natural and readily accessible. Based on their general reading experiences, students expected a connection between the previously presented sentences (i.e., the cue) and the following sentence (i.e., the target sentence). Hence, the possibility of using the cue as help increased. As also shown in the qualitative data, this type of cue was helpful most of the time, particularly for the items whose meaning failed to be clarified by other types of cues (e.g., *steal, run, buy* for A1). Nevertheless, the elaborated context cue became less powerful because of misunderstanding of the meaning. For instance, the cue for *see* as “accompanying” read *I’m glad that you came today and hope to talk to you again. Let me show you the way.* Participant A1 interpreted the second sentence as allowing the guest to get into the house. Her misinterpretation led to an inaccurate understanding of “seeing someone to the door” as “meeting someone at the door.” In other cases, the cue failed to distinguish the subtle differences in meaning (e.g., *swim, carry* for A1, *jump* in A2).

The degrees of effectiveness of the semantic frame cue varied across items. It was generally found that if the cue consisted of a synonym for the target sense, students could figure out the sense right away (e.g., *throw, swim* for B1, *leave, lose* for B2). For items that did not use synonyms as cueing verbs, students either failed to use the cue as help (e.g., *jump, bring* for B2), or did not catch the precise meaning of the target sense (e.g., *stand, fix* for B2). In addition, if the cueing verb was unknown to the participants, the cue did not seem to help (e.g., *run, see* for B1, *drop* for B2). The cue was equally unhelpful if students simply read through it with no deep processing (e.g., B1). In these cases, the effects of the cues were seriously impaired. However, the semantic frame cue worked well in disambiguating the meanings of some items that usually created difficulties for participants in other conditions (e.g., *carry* for B1). Hence, it is suspected that synonyms or near-synonyms may work best to disambiguate certain polysemous senses.

Overall, the cue of meaning chains did not provide impressive help in resolving word sense ambiguity. The original design attempted to depict the meaning variations of a polysemous word by presenting the shift of meaning from the core sense to a sense mediating the core

sense and the unknown sense. Unfortunately, the subtle changes in these senses did not contribute to a correct understanding of the unknown sense (e.g., *send*, *bring*, *leave*, *lose* for C2). For some items, students at best became sensitive to the polysemous nature of the target word (e.g., *run* for C1), but the cue rarely offered direct help. Although it is important that the mediating sense in the cue be close to that of the tested sense, practical concerns in the design limited the number of mediating senses used in the cue. It is likely that the more remote the unfamiliar sense is from the core sense, the more mediating senses are needed to make the chaining sequence smooth and logical.

5.3 Task Design

Concerning the task design. The first important finding was that participants did not always perform consistently in the two tasks. For instance, they provided an incorrect translation or choice for the sense they had understood (e.g., *send*, *lose* for A2, *stand* for D2). So, a wrong answer in either of the two tasks did not necessarily mean that students had an incorrect understanding of the meaning. Similarly, a correct answer did not always guarantee a correct understanding of the target sense (e.g., *throw*, *steal* for D2 in the translation task and *steal* for B1 in the multiple-choice task).

In fact, multiple-choice questions seemed to provide some kind of clue in helping students correct their misunderstanding (e.g., *burn* for A1). While doing the tasks, the participants tended to spend more time on the translation task than on the multiple-choice task. They frequently reported difficulty in figuring out an appropriate translation, partly because translation requires production than just recognition and is thus a more difficult task (Nation, 2001). However, when their understanding of the tested sense was challenged by a mismatch between their translation and any of the four choices in the question, they processed the meaning of the target sense all over again. Such a phenomenon not only explains the inconsistent performance in the two tasks, but also suggests that students may have achieved only partial understanding of the target sense when they did the translation task. Two possibilities then occurred: the understanding was somehow verified or corrected in the multiple-choice task or the understanding of the precise meaning was never achieved.

6. Conclusion

6.1 Effects of Cues on Comprehension

To answer the first research question on how each type of cue affected Iranian EFL learners' comprehension of unfamiliar senses of English polysemous verbs, both quantitative and qualitative data should be taken into account. First, the cue of elaborated context was found to be most helpful possibly because it simulates learners' reading processes in which unknown words are frequently encountered and contextual information constitutes the major resource for guessing word meanings. By contrast, the other two types of cues, as less natural for students to see the connection between the cue and the tested sense, seemed less powerful.

Another possible reason for the ineffectiveness of the two cue types is a requirement for processing at a higher level, that is, the processing of the underlying concept of word meanings. The idea of semantic frames lies in the activation of the concept or the background

frame that connects meanings of different words. Therefore, a deep processing of word meanings in order to access the underlying concept is necessary for the success of this type of cue. As for the cue of meaning chains, concept activation also plays an important role. Learners need to access the central concept encompassing different senses of a polysemous word, notice the meaning shifts in the chain of senses and draw analogies between adjacent senses so that they can eventually figure out the meaning of the remote sense. Apparently, processing this type of cue requires a lot more cognitive effort than processing the cue of elaborated context.

Students' reliance on L1 translation partly accounts for their unsuccessful processing of the above two types of cue. In the condition of semantic frames, synonyms, words for which students could easily find translation equivalents, tended to be more powerful in cueing the target sense. In the condition of meaning chains, L1 translations blocked the access of the concept that lays a foundation for connecting different senses of a polysemous word. In both conditions, the discrete Persian lemmas for the different senses of the same polysemous word were likely to activate different concepts in the L1, leading to a false assumption that the different senses were also discrete and unrelated. As Kroll and her colleagues suggested (Kroll, 1993; Kroll & Stewart, 1994; Kroll & de Groot, 1997), conceptual mediation is stronger from learners' L1 to the L2. The activated L1 concepts are likely to outweigh the concepts conveyed by L2 words. It is possible that the group of learners in the current study, though having achieved an intermediate level of English proficiency, was still unable to make full use of conceptual mediation in their processing of L2 words. Jiang (2000) argued that most of the L2 learners who learn the target language in a classroom setting fossilize at the second stage of using L1 lemma information to mediate L2 word processing. The connection between L2 lexicon and conceptual representations thus remains weak. Jiang's argument was indeed observed in the current study.

It is surprising that the cue of meaning chains resulted in even worse performance than the no-cue condition. The qualitative account revealed some negative effects of this type of cue, such as limiting, rather than broadening, the interpretations of varying senses of a polysemous word. The mediating sense in the chain, which had been supposed to be familiar to the participants, appeared to be problematic. Learners, with limited knowledge of the meaning range of the target polysemous word, tended to use the core sense to interpret the mediating sense. Hence, they were unable to see the meaning variations of the polysemous word. However, participants in other conditions did show an ability to draw analogies between the core sense and the unknown sense. They also underwent a process of extending the core sense to derive the meaning of the unknown sense by consulting the sentential context surrounding the unknown word. Was this because the designed meaning chain did not match students' logic in drawing analogies or the meaning chain created too much cognitive load? Did learners simply fail to differentiate senses in the cue, or did their different perceptions of the distinctiveness of senses lead to inconsistent performance? How did learners' different degrees of familiarity with the intermediate sense affect their understanding of the meaning chain? How might the logic in chaining senses be influenced by culture, learners' L1, and characteristics of individual items? To disentangle the puzzle,

thorough investigations using a different research design are needed. The current research design seemed impossible to suit this purpose.

6.2 Design of Tasks

Again, both quantitative and qualitative data were examined to answer the research question of how learners performed differently in the two tasks. Quantitatively, participants, except for those in Condition C, generally performed equally well in the two tasks after the multiple-choice results were corrected for guessing. Cross comparisons of percentages of correct and incorrect answers in the two tasks also indicated a certain degree of consistency between the two tasks in measuring students' comprehension in all cue conditions except for Condition C. The major reasons for the less consistent results in this condition could be accounted for by learners' difficulties in processing the cue and possible problems with the design, as previously discussed.

However, a close examination of individual answers and qualitative accounts disclosed different degrees of difficulty in the two tasks. A certain number of translations were marginally correct, suggesting that students may have achieved only a rough understanding of the target sense. Their understanding was somehow refined in the multiple-choice task as the task provided them a limited range of possibilities. The participants in the interview session did show a tendency of narrowing down the meaning for the target sense while doing the multiple-choice task. They also tended to take a longer time to do the translation task. These observations suggested that the multiple-choice task might be easier than the translation task. In fact, the qualitative account signaled a potential problem with the design of distractors: for some items, students only needed to decide between two choices! Under such circumstances, the task became less powerful in distinguishing degrees of understanding learners have achieved. Therefore, the distractors for some multiple-choice items could have been revised to meet the difficulty criterion needed to answer the research questions.

The above discussion also points to the issue of task effects on students' performance. Task effects have been reported in research on methods for testing reading comprehension. For instance, Shohamy (1984) found that multiple-choice items were easier than open-ended questions because the former required comprehension and selection while the latter involved production and called for a higher-level of language skills. Kobayashi's study (2002) also indicated effects of different test methods on reading comprehension scores. Significant interactions were revealed among test formats, text organization, and language proficiency. For high-proficiency learners, a well-structured text induced better performance in summary writing and open-ended questions but not in the cloze test. Compared with their less proficient counterparts, these learners were more susceptible to different test formats because an inappropriate format could not measure their reading comprehension skills adequately.

In order to explain how bilinguals control their two language systems in performing different tasks, Green (1998) proposed an inhibitory control model. The model states that language task schemas are first activated when learners encounter a task. The schemas then activate the target language required for the task and assign language tags at the lemma level while simultaneously inhibiting the non-target language. Therefore, when translating L2 words into

the L1, learners activate the language tags in their L1 and inhibit those in the L2. When they switch to another task that requires the access of the other language, they have to inhibit the previously activated task schema and language tags. A cost of switch is then observed in the time needed for doing the new task. Although Green's model only mentioned the cost of processing time, it is suspected that the cognitive efforts in the activation and inhibition of task schemas would also influence performance.

In the experiments, different tasks influenced learners' processing of the target senses to some extent. A common tendency was the verification of the understanding of the target sense in the multiple-choice task. Occasionally, participants had difficulty finding an appropriate translation for the meaning they had come up; such a meaning was then found in the multiple-choice question. In other cases, students did not know the meaning they had figured out was wrong until they found that none of the four choices matched their translation. These phenomena explain why students sometimes provided a translation unrelated to the choice they selected in the second task. Consequently, the translation task somehow influenced students' performance in the following task.

6.3 Implications for the Teaching and Learning of L2 Vocabulary

To the extent that vocabulary acquisition involves both incidental and intentional learning, the discussion of implications for L2 polysemy acquisition refers to implicit learning from learners themselves and explicit learning from teachers' instructions. Providing that many L2 learners have equated L2 learning with vocabulary acquisition and have downgraded the importance of other aspects such as strategic and pragmatic competence, does the current study imply greater emphasis on vocabulary acquisition? The answer is positive in a way that the study aimed to highlight the importance of polysemy and to encourage learners to develop sensitivity to L2 polysemy. On the other hand, the answer is negative because learning new senses for known word forms should not require so much effort as learning new vocabulary (Bogaards, 2001; Carter, 1998). The results of the current study indeed provided suggestions on how to acquire L2 polysemy in a more efficient way. The first key is learners' attention.

Pedagogically, to promote the acquisition of L2 polysemy, teachers should remind students to monitor their assumptions about an unusual, context-specific meaning of a familiar word (Haynes & Baker, 1993). It is also important for teachers to emphasize the underlying concept that connects a newly introduced sense with learners' known senses. To help students better grasp the word concept, teachers can encourage them to use monolingual dictionaries as often as possible so as to reduce reliance on L1 translations to interpret different senses of a polysemous word. As demonstrated in the current study, overusing L1 translations may lead to a false assumption that the related senses are discrete if these senses are translated into discrete L1 lemmas.

The study has made a modest attempt to explore L2 learners' cognitive mechanism in resolving lexical ambiguity resulting from polysemy. The results have confirmed the fundamental and significant contributions of context to the comprehension of L2 polysemy. Cognitively, learners were also able to use background semantic frames to understand related words and word senses, though learners' L1 seemed to play an important role in their access

to the underlying word concept. On the other hand, learners' reliance on the core sense has provided a rough picture of how word senses are organized in their mental lexicon. Such a picture needs to be refined with more empirical studies. Pedagogically, learning L2 polysemy is very similar to acquiring new L2 vocabulary in terms of the use of multiple strategies: noticing an unusual use of a polysemous word in a particular context, attending to various contexts to ascribe a precise set of semantic features to a polysemous word, and acquiring the underlying concept to connect related senses. A core aspect of a teacher's job is to sharpen students' skills in acquiring L2 polysemy. Once teachers have handed these keys to learners, it is easier for learners to resolve ambiguity from L2 polysemy and reach their goal of speedy and accurate mapping of a single word form to multiple meanings.

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Appendix

APPENDIX 1: An Example of Test Items Used in the Study

Target verb: *bring*

Condition A (elaborated context):

My conversation with Jane came to a surprising end. I asked her about her life as a young kid.

Condition B (semantic frame):

The gunman forced us into the room.

Condition C (meaning chain):

- (a) Remember to bring me a book.
- (b) What brings you here? What causes you to come here?

Condition D (control):

Nothing is provided.

Translation task

She could not bring herself to talk about her childhood.

Farsi translation _____

How are you confident that your answer is correct?

Not confident at all Very confident

1 2 3 4 5

Multiple-choice task

She could not bring herself to talk about her childhood. She ___ her childhood.

- (1) couldn't remember
- (2) had nothing to say about
- (3) didn't keep anything from
- (4) didn't want to discuss

Answer _____

How are you confident that your answer is correct?

Not confident at

all Very confident

1

2

3

4

5

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