

# Representational Development of Polysemous Words in Bilingual Mental Lexicon: Socio-Cognitive Perspectives

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## Abstract

When learning English, students often grapple with the meanings of ambiguous words. However, the acquisition of polysemous words by EFL learners remains underrepresented in the research literature. To address this imbalance, the present study intends to investigate the development of the mental representations of polysemous words in Chinese EFL learners. We first measured the students' lexical knowledge of polysemous words via word association, whereby they were divided into two groups: the high proficiency group and the low proficiency group. Then a questionnaire was administered to the students to investigate their English metaphoric competence and vocabulary learning strategies. The results indicated that the students' polysemy learning strategies and metaphoric competence could have modulated the representational development of polysemous words in light of the meaning extension mechanisms.

## Keywords

Representational Development, Polysemous Words, Vocabulary Learning Strategies, Metaphoric Competence

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## 1. Introduction

When learning English, students often grapple with the meanings of ambiguous words. Lexically ambiguous words can be divided into homonymy and polysemy based on the degree of meaning relatedness, while polysemy can be further divided into metaphorical polysemy and metonymical polysemy (Klepousniotou & Baum, 2007; Zhao, 2012). Given the importance and/or difficulty of acquiring English ambiguous words, researchers have conducted a myriad of studies on

how EFL learners acquire English ambiguous words from a psycholinguistic perspective (Zhang, 2004; Zhang, 2012; Shi & Tang, 2018) Nevertheless, relatively few studies were devoted to the study of the socio-cognitive factors that influence the acquisition of English polysemous words, which necessitated the present study to investigate the modulating effect of vocabulary learning strategies and metaphoric competence in the acquisition of English polysemous words, thus to facilitate the acquisition of such words.

## 2. Literature Review

In this part, we will first review relevant studies on the representational development of polysemous word knowledge, and studies that probe into the role of metaphoric competence and vocabulary learning strategies in EFL polysemy acquisition.

### 2.1. The L2 Representational Development of Polysemous Words

How the multiple meanings of a polysemous word are represented in the mental lexicon poses an intrigue to the researchers. According to the connectionist view of lexical networks, words interrelate with other words to form clusters of words. These clusters connect to other clusters and other words until the entire lexicon gets developed based on these immeasurable interconnections (Wolter, 2006). Connections between words allow newly acquired words to be easily assimilated within these networks because new words are not learned in isolation, but through links to already learned senses of the polysemous words. This developmental hypothesis lends support to the use of word association as a viable measurement of the lexical knowledge of polysemous words in the mental lexicon, which will be employed in the present study.

However, for L2 learners in classroom instruction settings, there are two practical constraints that differentiate L1 lexical development from that of L2. Jiang (2000) attributed the first constraint to the poverty of input in terms of both quantity and quality, in that L2 learners under classroom instruction can hardly receive sufficient, highly contextualized input in the target language. The second constraint relates to the presence of a pre-existing conceptual system together with a closely associated L1 lexical system. Such conceptual systems and lexical systems can significantly affect the development of L2 lexical competence. It is understandable that when the L2 words can be understood through their L1 translation equivalents, the learners would be less willing to pay enough attention to the contextual cues that foster the integration of the L2 lexical network. The two constraints conform to the social and cognitive dimensions of polysemy learning, the focus of the present study.

### 2.2. Metaphoric Competence as a Determinant of L2 Polysemy Acquisition

O'Reilly and Marsden (2021) emphasized the role of metaphor in foreign lan-

guage teaching, and the necessity to introduce metaphor into foreign language teaching practice, as it can serve as “a bridge” between SLA theories and language teaching theories. Littlemore and Low (2006) maintained that metaphoric competence includes both knowledge of, and the ability to use, metaphor, as well as the skills needed to work effectively with metaphor. A study conducted by Li (2019) revealed that Chinese EFL learners’ metaphoric was competence relatively low. This could obscure their understanding of the interconnections among the senses of the same word and, in turn, hinder the development of an L2 lexical network.

Attaching the importance of metaphor to lexical development, Cai (2003) posited that metaphor consists of a source of polysemy, and further found that it is metaphors that determine the advancement of polysemy learning. For second language learners, the semantic link between a core sense (chain as a metal part) and a figurative sense (chain as a way of business operation) can be easily discovered or understood, but the links between two figurative senses may be too vague to be comprehended. This further underlines the role of metaphoric competence in the representational development of polysemy knowledge.

### 2.3. The Role of Polysemy Learning Strategies

Choosing what strategies to use plays a crucial role in polysemy learning. Schmitt (2002) compared Japanese learners’ strategy use at four different age levels. He found that there was a trend away from form-based memorization towards more meaning-based processing from the lower proficiency groups to the higher. In addition, dictionary use makes an important contribution to vocabulary growth. Laufer and Hadar (1997) found that the more proficient the learners are, the better they performed with the monolingual dictionary. In this sense, teachers may provide guidance to students on what kind of dictionary to use and how to use a monolingual dictionary. By reading the explanations of a word in a dictionary, learners could know whether a specific sub-entry is likely to be a common meaning or an uncommon meaning. Then they should choose a sub-entry and relate it to the context of the word in the text. Dong and Zhou (2003) suggested that a dictionary can be a helpful venue for vocabulary teaching and learning, which enables the building of an integrated and systematic lexical network. This may partly contribute to the fact that high proficiency learners tend to read multiple explanations of a word.

Therefore, in order to address the socio-cognitive constraints on the representational development of L2 polysemous words, it is warranted to investigate the role of metaphoric competence and polysemy learning strategies to further facilitate our understanding of the EFL vocabulary acquisition process.

## 3. Research Methodologies

This section covers the research design and research findings of the word association task and the investigation of the socio-cognitive determinants of polysemy

learning. In this regard, we first conducted a word association task to investigate the developmental pattern of polysemous words in the bilingual mental lexicon and divided the students into two proficiency groups, and then a survey was carried out to investigate the students' strategies for learning English polysemous words, and probed into their metaphoric competence.

### 3.1. The Word Association Task

Word association tasks have been frequently used to assess the learners' vocabulary knowledge (Klepousniotou & Baum, 2007; Zhang, 2009; Li, 2019). In the present study, we employed a word association task to probe into the students' mental representations of polysemy knowledge, and subsequently divide them into two proficiency groups to further investigate the socio-cognitive factors underpinning the polysemy acquisition process.

In previous studies (Zhang, 2004; Zhang, 2009), the students' responses were classified into three categories: 1) paradigmatic responses; 2) syntagmatic responses; 3) clang and others, whereby the syntagmatic-paradigmatic shift is an indication of the learners' linguistic and cognitive development. In other words, the paradigmatic response is indicative of a higher degree of lexical or cognitive development than a syntagmatic response, which, in turn, is indicative of a higher level of development than a clang or nonsensical response (Wolter, 2001).

Altogether 126 sophomore students from a university in Zhejiang Province participated in the word association task. The critical polysemous words were selected from the word list used by Klepousniotou and Baum (2007), which contains 30 polysemous words (15 metaphorically polysemous words and 15 metonymically polysemous words), plus 30 filler words. The students were given 20 minutes to complete the word association questionnaire by writing down the first two English words that came to their minds upon seeing the target word. Most students finished the task within 16 minutes. Two English teachers with doctoral degrees participated in the response classification process.

Based on descending order of the proportion of paradigmatic responses by each student, where a higher proportion could entail higher proficiency, 63 students were assigned to the high proficiency group and the other 63 to the low proficiency group. Descriptive statistics of the word association responses from the students are shown in **Table 1**.

Regarding the frequency of their responses in each category (paradigmatic, syntagmatic, clang and others), a paired t-test revealed that the differences between the high proficiency group and the low proficiency group reached a significant level,  $t(24) = 2.12, p < 0.01$ . The findings are consistent with those of previous research (Wolter, 2001; Zhang, 2004; Shi & Tang, 2018), and reaffirmed the paradigmatic-syntagmatic shift. Plus, a closer examination of the students' responses found that the high proficiency group produced more associative words related to a certain sense of the polysemous word, which clearly evidenced a higher stage of representational development. Based on the division of proficiency groups in

**Table 1.** Descriptive statistics of the word association responses by each proficiency group.

Proficiency group	Response category	Mean frequency of responses by category (percentage)	Standard deviation
High	Paradigmatic	1918.76 (50.76%)	192.81
	Syntagmatic	825.30 (21.83%)	128.35
	Clang and others	1035.94 (27.41%)	145.22
Low	Paradigmatic	1370.84 (36.27%)	93.48
	Syntagmatic	616.74 (16.31%)	182.34
	Clang and others	1792.42 (47.42%)	205.31

terms of their polysemy knowledge, we can investigate the socio-cognitive factors that attribute to the outcomes of English polysemy learning.

### 3.2. Investigating the Socio-Cognitive Determinants of Polysemy Learning

After the word associative task, the same group of 126 students completed a questionnaire on polysemy learning. The questionnaire is comprised of 4 questions, which group the socio-cognitive factors as polysemy learning strategies and metaphoric competence. The questionnaire results can triangulate the findings of the word association task. The first 3 questions encapsulate the vocabulary learning strategies. Adopting an approach different from those with a complete inventory of vocabulary learning strategies, we formulated three critical questions to address this issue: how to know the meaning of new words, what English dictionary to use, and how to use the dictionary in learning polysemous words.

#### 3.2.1. Polysemy Learning Strategies

When encountering a new word, the students may resort to different venues to know its meaning. This could have a bearing on the learning effect. So the first question reads: While reading an English passage, what do you usually do if there is a word you are not familiar with? Based on the data gathered, the frequency of each choice and the corresponding percentage within each proficiency group are shown in **Table 2**.

Consequently, Chi-square tests for the responses of the low proficiency and high proficiency groups were carried out. The results indicated that high and low proficiency groups are significantly different in how to get the meaning of a new word [ $\chi^2 = 7.015$ ,  $p < 0.05$ ]. This suggests that low proficiency learners prefer guessing the meaning of new words from context rather than searching for the word in a dictionary.

For Chinese EFL learners, there are two types of dictionaries available: monolingual and bilingual. An English monolingual dictionary will present the

**Table 2.** Distribution of the students' responses on how to know new words.

Proficiency Group	Frequency of each choice (within group percentage)		
	Searching the word in a dictionary for explanation	Guessing the meaning of the word from context	Turning to other people for help
High	32 (50.79%)	18 (28.57%)	13 (20.64%)
Low	17 (26.98%)	31 (49.21%)	15 (23.81%)

headword, the definition, and all the examples and other lexical information in English. Bilingual dictionaries are written in two languages, English and Chinese in this case. Hence, the type of dictionary used could attribute to the quantity and quality of L2 input the learners receive. Therefore, the second question reads: What type of dictionary do you use most frequently in English learning? Preliminary analyses of the students' responses to this question are shown in **Table 3**.

Chi-square tests for the choice of dictionary use revealed that there was a significant difference in the two proficiency groups in English learning [ $\chi^2 = 10.532$ ,  $p < 0.01$ ]. Consistent with the findings of [Laufer and Hadar \(1997\)](#), such findings suggest that high proficiency learners are more willing to use monolingual dictionaries, which allows them to receive more quality input in the target language.

In the dictionary, a polysemous headword has several explanations for its multiple senses under the same entry. How to handle different explanations reflects an important aspect of the learners' strategy use in vocabulary learning. Thus, the third question reads: When looking up a dictionary, if there are several explanations for a word, which definitions do you usually read? The frequency and within group percentage of the students' responses to this question are presented in **Table 4**.

Consequently, Chi-square tests for the responses of the low proficiency and high proficiency groups were conducted. The results indicated that high and low proficiency groups are not significantly different in their reading of dictionary explanations [ $\chi^2 = 7.547$ ,  $p > 0.05$ ]. Further examination of the data revealed that high proficiency learners are more apt to read all the explanations; this may be attributed to the high proficiency learners' strong motivation for English vocabulary learning.

### 3.2.2. Metaphoric Competence

In the questionnaire, there is only one question in this respect, and the purpose of asking this question is to reveal how much the learners know about metaphor and metonymy as two mechanisms of meaning extension ([Klepousniotou & Baum, 2007](#); [Zhao, 2012](#); [Li, 2019](#)), which serves as an indicator of their metaphoric competence. In this regard, the fifth question reads as follows: The multiple meanings of a word in a dictionary are usually linked to each other on a

**Table 3.** Distribution of the students' responses on what dictionaries to use.

Proficiency Group	Frequency of each choice (within group percentage)		
	Dictionary with only English explanations	Dictionary with English and Chinese explanations	Dictionary with only Chinese explanations
High	26 (41.27%)	21 (33.33%)	16 (25.40%)
Low	8 (12.70%)	17 (26.70%)	38 (60.32%)

**Table 4.** Distribution of the students' responses on how to use dictionaries.

Proficiency Group	Frequency of each choice (within group percentage)		
	Read nearly all explanations of the word	Read the first one or two explanations	Only glance the explanations probably related to the context
High	28 (44.44%)	19 (30.16%)	16 (25.40%)
Low	12 (19.05%)	25 (39.68%)	28 (44.44%)

metaphorical or metonymical basis. Do you know the difference between metaphor and metonymy? If so, do you have any specific examples to illustrate the difference? Since this question is open-ended, the students' responses are divided into the following three categories: A. Not knowing the difference; B. Correctly stating the difference yet providing no examples; C. Correctly stating the difference and providing appropriate examples. The students' responses to this survey question are presented in **Table 5**.

As illustrated in **Table 5**, the results on metaphorical competence indicated that 57.14% of the 126 participants neither knew the difference between metaphor and metonymy nor provided any specific examples illustrating such difference. Chi-square tests for the responses of the low proficiency and high proficiency groups were carried out. The results indicated that high and low proficiency groups are significantly different in their awareness and identification of metaphor and metonymy as meaning extension mechanisms [ $\chi^2 = 6.273$ ,  $p < 0.05$ ]. This suggests that high proficiency learners are more competent in terms of metaphoric competence.

In a holistic view, we may conclude that vocabulary learning strategies and metaphoric competence are complementary to each other in the process of acquiring English words with multiple meanings.

#### 4. General Discussion

In this section, we will first discuss the socio-cognitive locus of conceptual restructuring based on the findings of the present study, and then present its implications for English polysemy teaching and learning in classroom instruction settings.

**Table 5.** Distribution of the students' responses on metaphoric competence.

Proficiency Group	Frequency of each choice (within group percentage)		
	Not knowing the difference	Correctly stating the difference yet providing no examples	Correctly stating the difference and providing appropriate examples
High	23 (36.51%)	26 (41.27%)	14 (22.22%)
Low	49 (77.78%)	12 (19.05%)	2 (3.17%)

#### 4.1. The Socio-Cognitive Locus of Representational Restructuring

From a developmental perspective, lexical/conceptual restructuring is an indispensable process in the representational development of lexical knowledge. Restructuring proceeds in two dimensions: the first is to categorize the vocabulary learned on the basis of relevance; the second relates to more sophisticated matching between words and concepts (McLaughlin, 1990). The representational development of English polysemous words shows the restructuring of semantic representations, that is, reorganizing the semantic representations in line with the cognitive patterns of the second language. For native speakers, it is a natural and implicit process. For EFL learners, a natural structuring in the mental lexicon is rendered unlikely given the practical constraints of the poverty of quality input and a pre-existing L1 conceptual system. Hence, the L2 learners must consciously restructure the mental lexicon. In addition to conceptual restructuring within the representation of a single meaning, the crucial component of L2 polysemy learning is to establish connections between the multiple senses of a polysemous word (Zhang, 2004; Li, 2019).

Previous studies have underlined the importance of metaphoric competence in polysemy learning. Chen and Lai (2015) maintained that the instruction on metaphoric mappings was helpful in facilitating the learners' identification of expressions involving more abstract concepts with complicated mapping relationships, thus improving their metaphoric competence and the lexical network restructuring process.

#### 4.2. Teaching Implications

Vocabulary serves as the building block of a language. The present study could on how to teach and learn polysemy in a more efficient way from socio-cognitive perspectives.

As to polysemy learning strategies, we stressed the importance of quality input, whereby students of the high proficiency group preferred using a monolingual dictionary. From a pedagogical perspective, this relates to how polysemous words are taught. In traditional instruction settings, the teachers tend to directly provide the students with the Chinese translation equivalents of the English words, especially when the students are using an electronic dictionary, where the students only get the Chinese translations of the headword. In this case, the students tend to strengthen the connections with the L1 conceptual system, other



than establish connections between L2 words. This partly explains why Chinese EFL learners cannot establish appropriate connections among the multiple senses of a polysemous word. Zhang (2004) proposed that, after the initial stage of L2 learning, the teachers should try to use L2 explain L2 words, as a remedial measure to increase the student's L2 exposure and address the imbalance derived from a dominant L1 conceptual system.

Moreover, it is suggested that teachers inform the students of the cognitive basis among the senses of an English polysemous word (Zhang, 2010; Shi & Tang, 2018). For students with higher metaphoric competence, this measure could familiarize the students with the meaning extension mechanism of polysemous words, metaphor and metonymy, thus effectively enabling them to establish reliable connections among multiple senses of a polysemous word. In this way, the students could build up a more sophisticated L2 lexical/conceptual network that incorporates the senses as interconnected nodes.

## 5. Conclusion

In general, we first used a word association task to assess the students' polysemy knowledge and divide them into two proficiency groups. Then a boiled-down questionnaire on the socio-cognitive factors of polysemy learning was administered. The results indicated that the high proficiency group tends to receive more quality input in line with their learning strategies, and is more familiar with the meaning extension mechanisms of polysemous words. This lends support to the implications for teaching and learning English polysemous words. From a social-cultural perspective, the teachers shall instruct the students on how to strategically use a monolingual or bilingual dictionary to increase the amount of quality input; from a cognitive perspective, the teachers shall make efforts to improve the students' metaphoric competence, thus knowing the cognitive basis among the multiple meanings of an English polysemous word. However, we should bear in mind that the sample size of the present study is relatively small compared to similar studies. Besides, the representational development of lexical knowledge could be investigated with more sophisticated psycholinguistic methods, such as eye-tracking and neurophysiologic methods.

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## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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