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Review

# A brief review of the effects of image schema theory on the acquisition of polysemy

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## Abstract

Cognitive linguistics can inspire language pedagogy. As one of the core conceptions of cognitive linguistics, image schema theory can be integrated into foreign/second language teaching to facilitate learners' acquisition of word meanings, especially those polysemous words which have long been difficult points for both learners and instructors. This research conducts a thorough review of the image schema theory and polysemy in cognitive linguistics and discusses the feasibility, and potential benefits of the teaching method based on image schema theory. Also, this research synthesizes the previous empirical studies about the effects of image schema theory on the acquisition of polysemy. It is found that the effectiveness of image-schema-based instruction has been generally recognized; however, the inconsistencies in the previous studies necessitate further exploration. Also, future studies can pay more attention to the effects of image schema theory on the acquisition of polysemous verbs.

**Keywords** image schema theory; image-schema-based instruction; polysemy acquisition

## 1. Introduction

Polysemous words have long been difficult points for both learners and instructors (Akamatsu, 2010; Mitsugi, 2017; Morimoto & Loewen, 2007; Tyler & Evans, 2004). The semantically related or unrelated senses of the same word often leave learners with the impression that word meanings are arbitrary and disorganized. For instructors, the paucity and difficulty can be attributed to the lack of a framework that can provide a systematic view of polysemous words. Also, since polysemous words sometimes can be understood by the learners intuitively from the context, their importance and learnability have not been given enough attention.

According to the views of cognitive linguistics, language forms are motivated based on embodied conceptualizations (Liu & Tsai, 2021). Therefore, not only do there exist connections among different senses of words, but the understanding of the meanings of polysemy is also closely connected with learners' experience. Based on image schema theory, the peripheral or figurative senses of a word are interconnected with its core schema. If learners can grasp the core schemas, the peripheral senses can be acquired more naturally and effectively. As Liu and Tsai (2021) stated, cognitive-linguistics-inspired pedagogy can "inform, inspire, and enhance language pedagogy" (p. 543). Therefore, image schema theory can be applied to vocabulary teaching to promote learners' polysemy acquisition.

The purpose of this research is to deal with the image schema theory and polysemy in cognitive linguistics. It intends to conduct a thorough review of the research which theoretically and empirically examines the effects of image schema theory on the acquisition of polysemy. This research focuses on the issues such as justifications, effectiveness, and improvement of instruction by summarizing the limitations of the previous studies and proposing further directions about the teaching method inspired by image schema theory in cognitive linguistics.

## 2. Image Schema Theory

### 2.1. Image schema

Image schema is one of the key concepts in cognitive linguistics. It was first proposed as a notion within the scope of conceptual metaphor studies by

Lakoff and Johnson (1980). Then, in the seminal work by Johnson (1987), a further elaboration of the concept of image schema has been provided. It is defined as a pattern of our motor-perceptual interactions which structures our sensory experience (Johnson, 1987). Also, according to Oakley (2007), image schema is "a condensed redescription of perceptual experience for the purpose of mapping spatial structure onto conceptual structure" (p. 215).

To promote better understanding, image schema can be seen as a composite notion that is composed of two separate notions of "image" and "schema". Image is the psychological representation of our sensory-perceptual experiences (Croft & Cruse, 2004). For example, with eyes closed, the image of a *sweater* can be imagined within our mind and the mental picture formed often contains detailed information about the object, such as the size, shape, color, and texture. Different from the image, based on personal experiences and knowledge, schema is a more generalized and abstract cognitive structure in the mental space that can be stimulated by the appearances of similar scenarios. Therefore, image schema can be understood as the schematic versions of images. To some extent, image schema is both "imagistic" and "schematic" since it is the abstract generalization of multiple instances of our sensory experiences of the world (Tay, 2021, p. 161). As is summarized by Li (2007), an image schema is an abstract structure derived from the outside world; based on the embodied philosophy, it organizes seemingly unrelated experiences into certain common structures.

Since the events experienced in the physical world are different from each other, image schema can be categorized into different types. According to Johnson (1987), Lakoff (1987), and Li (2007), the types of image schema are limited, and the most fundamental types are the following: CONTAINERS; SOURCE-PATH-GOAL; PART-WHOLE; LINK; BALANCE; CENTER-PERIPHRY; UP-DOWN; FRONT-BACK.

### 2.2. Image-schema-based instruction (ISBI)

Image-schema-based instruction (ISBI) is defined as a kind of pedagogical method by which the process of vocabulary instruction is mediated by the use of image schema (Morimoto & Loewen, 2007). As is aforementioned, the types of image schema are limited; however, the events or experiences in the physical are various and infinite. Therefore, based on this prerequisite, instead of instructing the various meanings of words exhaustively, ISBI aims at providing learners with the basis (i.e., core meaning) on which they can grasp, process, and transmit what has been taught and comprehend the novel usages in different contexts. Many researchers have stated the benefits of ISBI from the theoretical perspective (Khodadady & Khaghaninizhad, 2012; Makni, 2014; Mitsugi, 2018; Morimoto & Loewen, 2007; Tyler & Evans, 2004), and its main rationale can be accounted for from the following aspects.

First, the employment of image schemas can help learners understand the core meaning of the words and how the peripheral meanings are interconnected with the core meaning. By acquiring the underlying image schemas, learners can have a deeper understanding of the motivation of the meanings of words. Also, learners can understand how the metaphorical senses in the different contexts are derived from the prototype. If learners can become aware of the cognitive mechanisms of polysemous words' meaning formation, it is reasonable that they will learn and use these words easier than those who are not being taught (Csábi, 2004).

Second, with the instruction of underlying image schemas, more resources can be employed by learners to comprehend the word meanings other than over-relying on the equivalents in their first language. Traditional vocabulary teaching often applies translation-based instruction with which learners tend to connect the word meanings with their first language equivalents. However, it is often the case that the meanings of words in different languages are not strictly equal to each other and there often exist some nuances in the semantic ranges of the seemingly equivalent words. Figure 1 shows the process of how image schema can help learners comprehend the word meanings of the second language without being constrained by their mother tongue.

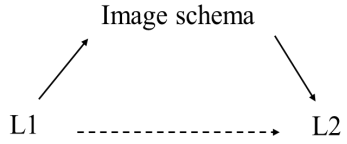



Figure 1. Relationship between L1, L2 and image schema (Morimoto & Loewen, 2007).

Thirdly, since ISBI can receive more learners' attention for the similarities of the word meanings, therefore learners can gain a clearer understanding of their meanings by scrutinizing how they relate to and differ from each other. It is a valid point in that based on the levels-of-processing theory proposed by Craik and Lockhart (1972), ISBI involves the learning of vocabulary at a deeper cognitive level with more cognitive efforts, thus the word learning process and the retention over time can get enhanced.

## 3. Polysemy

### 3.1 The notion of polysemy

In the field of second language acquisition, polysemy is commonly recognized as one of the learning obstacles for learners (Mitsugi, 2017). It is defined as words that have multiple meanings. These semantically related meanings can be difficult for learners to understand and retain. Take the polysemous preposition *over* as an example, in different contexts, this preposition can be interpreted as different meanings (e.g., locate higher than; transfer something;

completed or finished; on the other side of). Then the question arises: if learners are presented with an unorganized list of these semantically related or even unrelated meanings, it is much more likely that the lexical class will become fragmented and leave learners with the impression that the senses of words are arbitrary. However, despite the recognized difficulties for learners, such an issue still has not received much attention in the currently used textbooks (Tyler & Evans, 2004).

It should also be noted that in some instances, words with multiple meanings are not necessarily polysemous. The definition of polysemy, to some extent, is overlapped with homonym which denotes words spelled and pronounced the same but differ in meaning. For example, the word *bark*, the noun form of which means the outer covering of a tree while the verb form means the sound made by dogs, guns, or voices. They are homonyms that can be deemed as two different words but coincidentally share the same spelling and pronunciation. Such overlap in semantics in turn has posed more difficulties for learners to make the differentiation between word meanings.

### 3.2 Polysemy in Cognitive Linguistics

Within the field of cognitive linguistics, the conception of polysemy has dramatically changed. As a central agenda of cognitive semantics, one of the branches of cognitive linguistics, polysemy has been considered to have certain literal bases and is semantically motivated (Johnson, 1987; Lakoff, 1987). It is argued that polysemous words are natural categories of senses and based on the basic or core meanings of the polysemous words, other figurative senses can be understood naturally. According to Johnson (1987), with the transformation of image schema and the devices of metaphor and metonymy, the figurative/periphery meanings of words extend from the initial core meanings/prototypical meanings. It has been observed across different languages that polysemous words are motivated and pervaded by the transformations of image schemas (Tay, 2021).

With the insights from cognitive linguistics, ISBI maintains that various senses of words are actually derived from a single image schema based on which different meanings derive as a result of cognitive operations. Therefore, learners can understand and retain the word meanings more clearly and profoundly if teachers can show how the words extend from the initial meaning with the employment of image schemas.

## 4. The Effects of ISBI on the Acquisition of Polysemy

### 4.1 The effects of ISBI on the acquisition of polysemous prepositions

Apart from the theoretical discussion of the effectiveness of image schema theory on the acquisition of polysemous words, much empirical research has been conducted to examine the effects of image-schema-based instruction on the acquisition of polysemous prepositions (Chen & Xu, 2009; Cho & Kawase, 2012; Mitsugi, 2018; Morimoto & Loewen, 2007; Tyler et al., 2011).

As one of the earliest attempts to explore the potential effectiveness of ISBI, Morimoto and Loewen (2007) compared the effects of ISBI and traditional translation-based instruction (TBI). In their research, fifty-eight Japanese English learners from three intact classes were selected as the participants. These participants were divided into three groups (i.e., two treatment groups received ISBI and TBI respectively; one control group received no instruction). The target words used are the verb *break* and preposition *over*. The acceptability judgment test and production test were combined to examine the effects of instruction methods. The results were mixed in their research. It was shown that both ISBI and TBI were effective when compared to learners who received no instruction. As to the comparison between ISBI and TBI, no significant differences were found between the ISBI and TBI groups in the tests of *break*; however, in the acceptability judgment test of *over*, learners in the ISBI group performed significantly better than those in the TBI group.

Their research findings are of great importance in three aspects. First, it is empirically demonstrated that the instruction method based on image schema theory is beneficial for learners to acquire polysemous words. Second, ISBI is much more effective than traditional TBI in the teaching of polysemous prepositions. Third, the effectiveness of ISBI might be influenced by the word class (i.e., the conceivable differences in the instruction of preposition over and verb break). However, since this research is "one of the first attempts" (Morimoto & Loewen, 2007, p. 353), many further questions have been raised. Their study is limited in that only one polysemous preposition over was selected, and the effects of ISBI on the simultaneous teaching of other prepositions (e.g., on, above) can be further explored. Also, whether ISBI can benefit the learning of some phrasal verbs was not included in their research.

To contribute to the ongoing research and fill in the gaps in the previous study, Chen and Xu (2009) focused on the polysemous prepositions *on*, *over*, *above*, and empirically verified the effects of ISBI. In this research, forty-six participants (Chinese learners of English) were also divided into three groups. This class experiment process followed the pattern of pretest, instruction, and three posttests (at the interval of two days, seven days, and four weeks). It is found that in terms of the test types, ISBI had differential effects on the learners' acquisition of polysemous prepositions. As to the acceptability judgment test, the effects of ISBI are significant in the teaching of *on* and *above*; in the production test, the effects of ISBI are significant in the teaching of *over* and *above*.

Their findings further demonstrated the effectiveness of ISBI; however, it should be noted that

the result that ISBI was significantly better in the production test of *over* is inconsistent with the findings of Morimoto and Loewen (2007). Apart from this, the specific effects of ISBI on other prepositions are still not that clear. Therefore, more in-depth and comprehensive explorations are necessary to have a better understanding of the effects of ISBI. In the following research conducted by Tyler et al. (2011), polysemous prepositions *to*, *for*, and *at* were analyzed to test the effects of cognitive linguistics-based interpretation of the word meanings (i.e., to explain the image schemas of these prepositions). By comparing the scores in the tests before and after the instruction, it is found that participants who received ISBI witnessed significant improvement in their understanding of the senses of polysemous prepositions. However, in this research, the participants are advanced learners of English, and during the instruction process, many engaging visuals and contextualized cues were provided. Also, no production tests were involved in their measurement. As a result, the generalizability of this research might be adversely influenced.

Based on the insights of cognitive linguistics, Cho and Kawase (2012) examined the learnability and teachability of ISBI by conducting a classroom experiment. In their research, the teaching processes were given a detailed explanation. The five-phase teaching process made recurrent use of the image schemas, especially the central image schemas to help raise learners' awareness and enhance their application ability. It demonstrated again the usefulness of ISBI which is more pedagogically effective than the traditional method in which the motivated nature polysemy has not been interpreted. One of the values of their research is that a qualitative analysis of the instructors' viewpoints of ISBI was supplemented. Instructors advocated the potential benefits of this new method; however, anxiety also arose during the class. Therefore, researchers proposed that sufficient attention should be paid to ISBI, and more feasible teaching materials should be developed to help language teachers to familiarize and applicate this novel approach.

Different from the aforementioned study which took instructors' viewpoints into consideration, Mitsugi (2018) explored the effects of ISBI from the other perspective. It focused on the learners' perception by analyzing the questionnaire completed by fifty-six Japanese students after the experience of ISBI. Results showed that learners' perceptions of this method of instruction were mixed. Although most of the learners acknowledge the positive effects of ISBI (i.e., its applicability, efficiency, and practicality), many learners held that the insufficient understanding of image schemas actually negatively influenced the learning effects. Therefore, to make the most of the potential benefits of ISBI, researchers concluded that continual training and exercise are necessary. It can be said that the questionnaire results by Mitsugi (2018) echoed the findings of Cho and Kawase (2012). With the combination of both instructors' and learners' perceptions of ISBI, the discussion of its effectiveness become more objective and comprehensive.

To improve the teaching effects and specify the teaching process of ISBI, Fujii (2016) made the distinction between top-down and bottom-up approaches and empirically compared the effectiveness of these two approaches. The top-down ISBI refers to the teaching process that image schemas are provided prior to the sample sentences while the bottom-up approach means sample sentences are provided beforehand and then a group discussion of the image schemas is included. Taking six polysemous prepositions *at*, *in*, *on*, *to*, *for*, *with* as materials, it is found that the bottom-up approach was more effective in learners' meaning comprehension and retention than the traditional top-down approach. This research is an enlightening attempt to improve the ISBI but follow-up studies are still required to further modify the teaching process and examine the effects on other prepositions.

### 4.2 The effects of ISBI on the acquisition of polysemous verbs

Given the polysemous nature of prepositions, most of the previous research focused on the exploration of the effects of ISBI on the acquisition of polysemous prepositions. Relatively few studies examined whether ISBI is effective in helping learners acquiring polysemous verbs. In the early studies conducted by Verspoor and Lowie (2003), several verbs such as *boost*, *grapple*, *skim*, *shatter* were included as the materials to examine the effects of ISBI on the guessing and long-term retention of verbs. By receiving the instruction and completing the pretests and posttests, Dutch English learners showed significantly better performance in the guessing and long-term retention of verbs' core meaning, figurative meaning, and abstract senses. However, the types of words still merited further exploration since in the context of this research, Dutch learners of English might be influenced by their geographical and cultural factors (e.g., the country is flat). As a result, some of the literal meanings of words might be unfamiliar to Dutch learners of English.

Akamatsu (2010) conducted targeted research about the effects of ISBI on the acquisition of hold, put and run. In this research, two groups of Japanese English learners were included (one received instructions about core schema and the other with no instructions). The result is interesting in that no significant differences were found between the test performances of the two groups of participants. Therefore, the researcher argued that ISBI might not that effective in the acquisition of polysemous verbs. The theoretical explanation was that learners' performances were influenced by their prior vocabulary knowledge. As a result, short-term instruction failed to bring many changes.

Similar to the previous studies about polysemous prepositions, Sato (2015) compared the effects of ISBI and TBI on the acquisition of *look* and *see*. The research findings are positive that when compared with the traditional TBI, ISBI was also effective, and in terms of

long-run retention learners who received ISBI were performed significantly better than those who received TBI. Because of the "intra-lexical and inter-lexical network" constructed (p. 38), image schemas helped learners personalize the senses of the words instructed.

In a recent study by Cheng and Li (2016), phrasal verbs were used as the materials. Two intact classes with similar proficiency levels were selected and received ISBI. It is found that the scores of the group that received ISBI were significantly better than the TBI group in terms of receptive tests. However, no production tests were involved in their research, therefore, the generalizability might be affected. In the latest study, based on the force dynamic, a typical image schema, Mueller and Yasuhiro (2019) examined its effects on Japanese learners' acquisition of English verbs such as *force*, *get*, and *make*. With the assistance of dynamic diagrams, learners showed extensive gains on both the posttest and delayed posttest. However, this study has not found evidence that the ISBI is significantly more effective than the conventional instruction. The researchers suggested that the conventional translation-based approach can be combined with ISBI to reduce the risk that learners assimilate the L2 force dynamic verbs into L1 categories. Additionally, the necessity of exploring the effects of specific type of learning (e.g., implicit and explicit) on the effectiveness of ISBI has been proposed. In summary, as is shown in most research findings, ISBI has presented potential benefits in the learners' polysemous verb acquisition. However, up to now relatively few studies focused on polysemous verbs and further empirical research are necessary to examine and improve ISBI.

## 5. Conclusion

This paper presents a thorough review of the effects of image schema theory on the acquisition of polysemy. Inspired by the views of cognitive linguistics, the instruction method based on image schema theory is intended to mediate, facilitate and improve the learning effects of polysemous words which have long been difficult for both learners and instructors. With a thorough revision, the findings and limitations of the previous studies can be accounted for from the following three aspects.

First, as a novel pedagogical method, ISBI is theoretically and empirically effective for learners' acquisition of polysemous words, especially polysemous prepositions. Many prepositions such as *on*, *over*, *above*, *to*, *for*, *at* have been empirically examined. It has been demonstrated that ISBI can be as effective as the TBI, and the potential benefits of ISBI are also presented in terms of learners' long-term retention of polysemous senses of words.

Second, although the benefits of ISBI have been generally recognized, there still exist inconsistencies among previous research findings. For example, as to the specific effects of ISBI on the acquisition of polysemous prepositions, the results of acceptability and production tests are mixed. Apart from this, the effects on polysemous verbs also exist inconsistencies since no significant difference in learners' scores has been observed. Therefore, further research and replications of previous studies are necessary to better understand the conditions, process, and specific effects of ISBI.

Third, from the review, it is found that most of the studies focused on the effects of polysemous prepositions; however, the polysemous verbs were under-explored. When compared with prepositions, the senses of verbs can be much easier for learners to deduce. However, whether ISBI can facilitate the learning of polysemous verbs is still worthy of further exploration.

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