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Schema-Based Instruction on Learning English Polysemous Words: Effects of Instruction and Learners' Perceptions*

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The purpose of this study is to investigate the effectiveness of two instruction methods for teaching polysemous English prepositions (*at*, *in*, *on*) and to explore learners' perception on learning tools used in the instruction when learning polysemous words. The first study investigated the effectiveness of schema-based instruction (SBI), which is a form of instruction based on the insights of cognitive linguistics (CL) and is a way of teaching, which provides learners with the schematic core meaning. Whereas, translation-based instruction (TBI) is one of the conventional ways of teaching prepositions as polysemous words, which offers learners a list of several meanings of each preposition. Two tests, as pre- and post-tests were carried out to examine the effectiveness of the instruction. A second study explored how leaners perceived the learning tools in each instruction method. The methods consist of the core schema and translations in dictionary, which were analyzed with the motivation to be able to conduct more effective instruction on polysemous words in the classroom. For this study, data was collected by a questionnaire and analyzed qualitatively to extract constructs that learners have on both instructions. Based on the results of these two studies, this paper argues that the core-schema approach to teaching English propositions is more effective than the conventional approach. Furthermore, the core schema approach is practical to administer to learners; however, it was discovered that learners perceived both benefits and disadvantages in the two instruction methods and suggested the necessity of separate-use depending on the learning situation.

Keywords: schema-based instruction, core schema, cognitive linguistics, learners' perception

1 Introduction

Polysemous words have been widely regarded as a learning obstacle for English learners. The source of difficulty arises from a phenomenon in which

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each word has multiple senses. These senses are semantically related; however, they are seemingly chaotic for English learners. This kind of polysemous nature causes a learning difficulty for learners in their ability to understand and entirely grasp the multiple senses of polysemous words intuitively (Tyler & Evans, 2004; Morimoto & Loewen, 2007). The other cause of difficulty in learning comes from the difference of word-sense perception between Japanese learners of English and native speakers of English. Imai (1993) investigated how American students and Japanese English learners understand the polysemous verb *wear*, by a word-meaning-categorization task. The results revealed that Japanese English learners categorized multiple senses into three categories, whereas American students simply categorized them into two. Imai argued that the difference which resides in Japanese English learners was attributed to their mother language. Imai (1993) pointed out that Japanese English learners strongly believed that there was a one-to-one correspondence in meaning between English and Japanese words, and this belief led to the difference in their word-perception. This problem in word-sense perception makes things more difficult for Japanese English learners to grasp and in their ability to use polysemous words intuitively.

Nation (2001) suggests that the better way to learn polysemous words is to define a word by the concept that runs through all its senses. In addition, McCarthy (2001) emphasizes the importance of the central senses of a word for learning polysemous words since it often becomes the underlying component of semantic extensions. Their common insight is the concept of "core meaning" (Tanaka, Sato & Abe, 2006, p.6) that is based on the insights from cognitive linguistics. Core meaning refers to the common underlying meaning of a word, as opposed to the most frequent or the primary meaning. Furthermore, it is a better way to lessen the negative impact of Japanese learners' mother language on learning polysemous words. It is explained in image-schema called core schema, which includes brief explanations about how learners should construe the central or focal concept of the meaning. Because core schema is mainly used for explanation and is language-neutral in nature, it provides a better understanding of the L2 word senses without being constrained by the learners' mother language equivalent (Morimoto & Loewen, 2007).

The aim of this study is to apply the idea of core meaning to the instruction of polysemous words. In particular, one of the focuses is on considering two types of instructions and comparing their effectiveness on Japanese learners of English. The instruction types are divided into two. The one is in regard to core meaning and called schema-based instruction (SBI), which consists of an explicit explanation by instructors in which they identify core meaning and the way of utilizing the concept of core schema, not just by providing it. The remaining type is a more conventional type such as translation-based instruction (TBI), which utilizes Japanese translations of

several senses of a word. Another area of focus in this study is to understand the subjects' perceptions of SBI and TBI. Previous researches applying core meaning on instruction showed the results of effectiveness of core meaning through measuring lexical knowledge about the target polysemous words by using tests as a measuring tool. It is essential for researchers to understand learners' perceptions on the instructions in order to get deeper insight on how to effectively design instruction and cater to learners in a more efficient manner. This study focuses on a new angle of learning and teaching polysemous words effectively.

2 Core Meaning as a Cognitive Linguistic Approach

Cognitive linguistics (CL) is becoming one of the important disciplines in the field of teaching and learning English as a Foreign Language (EFL). In recent years, many researchers have applied the idea of CL to EFL learning and teaching to consider how learners could benefit from the insights of CL (Littlemore, 2009). These attempts have been accumulated theoretically (e.g., Littlemore, 2009; Tanaka, et al., 2006; Tyler, 2012) and empirically (e.g., Akamatsu, 2010; Boers, 2000; Cho & Kawase, 2011, 2012; Fujii, 2016; Imai, 2016; Makni, 2014: Mitsugi, 2013; Morimoto & Loewen, 2007; Sato, 2015).

Recent investigations on learning and teaching polysemous words with the CL approach have demonstrated how English learners could benefit from the insights of core meaning (e.g., Fujii, 2016; Mitsugi, 2013; Morimoto & Loewen, 2007; Verspoor & Lowie, 2003). These studies applied the idea of core meaning to polysemous words and examined the effectiveness of core meaning. Core meaning is based on the core theory proposed by Tanaka et al. (2006) and they suggest that if a word form is the same, it has a common underlying meaning, and that behind each polysemous word, there is a single overarching meaning which governs all its senses. This overarching meaning is known as "core meaning." Core meaning is the best exemplar of the usages, as well as a concept that grasps the whole semantic coverage of a word.

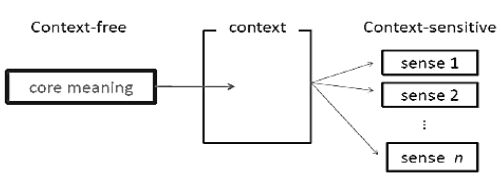

Figure 1. Concept of core meaning (Tanaka et al., 2006)

As in Figure 1, when core meaning is put into each context, various senses come out, thus, the core meaning is the context-free meaning behind every exemplar of a word.

Core meaning has descriptive representation and image-schematic

representation (Sato & Tanaka, 2009). As a descriptive representation, for example, *in* is illustrated as "internal space." An image-schematic representation, on the other hand, is explained with an illustration of a three-dimensional container which contains an object in it. This image of physical space is applied to the expansion of other spatial relationships by the projection of the image: psychological space, social space, temporal space (Tanaka et al., 2006). The core schema of *in* is shown on the left in Figure 2.

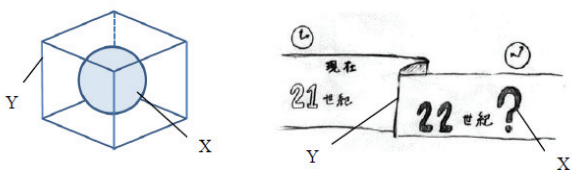

Figure 2. Core schema of *in* (left) and image of temporal use of *in* (right [1]) (Mitsugi, 2013)

The main function of core schema on the preposition *in* is to show a spatial relationship between content (X) and container (Y). This image extends to the temporal use of *in*. For example, "*Who knows what will happen in the 22nd century?"* (Tanaka et al., 2007, p.85), "X" is the content (an unknown event) and "Y" is the container (temporal-spatial frame). In this approach, the various peripheral senses are extended through this concept with the projection of the core schema. The target words in this study are the prepositions *in*, *on*, and *at* because they have strong polysemous nature and are frequently said to be some of the most difficult grammatical items for EFL learners to use properly (Cho, 2002). SBI in this study is basically based on the explanation above about *in*, and how to apply core schema as the device to extend onto relating other extended meanings.

3 Previous Studies

Morimoto and Loewen (2007) presented their core meaning experimental study, which analyzed, *over* and *break*. They also examined the effectiveness of their instructions by using core meaning. They set three groups as image-schema-based (including core schema) instruction (ISBI) group, translation-based instruction (TBI) group, and a control group that received no instruction. The results for *over* showed the effectiveness of instruction with core meaning whereas *break* did not. The results in this research are of value to show a difference in effectiveness depending on the word-class, that is, their instruction with core meaning was helpful in learning prepositions.

[1] The picture on the right side is from Tanaka et al. (2007) and reproduced by the author.

Yasuhara (2011) examined the effectiveness of instruction with core meaning focusing on the prepositions (*at*, *in*, *on*). She divided students into three groups, including image-schema and core-meaning-based instruction (ISCBI) group, core-meaning-based instruction (CBI) group, and TBI group. In her case, CBI had just an explanation of the concept of core meaning without core schema. One of her main focuses was on identifying differences in effectiveness between instructions using core schema and instructions without it. This research yields that there was no effect on CBI group. Yasuhara discussed that it was attributed to the high abstraction of the semantic concept of core meaning. In other words, learners felt some sort of difficulty in using core meaning appropriately without visual support by core schema. Furthermore, Yasuhara examined the difference in effectiveness of instruction, based on the participants' pre-learned knowledge about prepositions. The results showed effectiveness only in all instructional types among the lower group. From this fact, Yasuhara stated that learners in the upper group might have already constructed their images of the target prepositions through their previous inputs.

Mitsugi (2013) investigated the effectiveness of core meaning on teaching the temporal-use of the English prepositions (*in*, *on*, *at*, *by*). Mitsugi set three groups as core-meaning-based instruction (CMBI) group, TBI group, and a control group which received no instruction. CMBI was practiced in an implicit learning style, and included the explanation of how different senses are semantically related to core meaning. As further analysis, each instructional group was divided into an upper group and a lower group based on their average score of the pre-test used in research. Furthermore, detailed analysis was carried out to see the difference of effectiveness corresponding to the preposition type. The results of the analysis on the overall tendency showed that CMBI was not more effective than TBI. In a second analysis, effectiveness of core meaning was shown only in the lower group. The results in the last analysis showed effectiveness of CMBI for *in* and *at* when compared to TBI, and effectiveness of CMBI for *on* was shown when compared to the control group. As Mitsugi discussed, the results for the upper and lower groups, as well as the three different prepositions, indicated that there were cases where CMBI was significantly more effective than TBI. The results in this research are of value to show a difference in effectiveness depending on the preposition types in temporal use. Moreover, this study suggests the insufficiency of implicit instruction when core meaning is used in teaching English prepositions.

All the previous research above showed a partial effectiveness of instruction with core meaning; hence its instruction is partly effective for learning polysemous words. However, further research is required in order to demonstrate the effectiveness of instruction including more precise explanation on core schema, and explicit instruction about the concept of core meaning itself and semantic extensions. Moreover, considering

perceptions that learners possess for the learning tools in SBI and TBI, we are reminded that this is still an under-researched area.

Based on the arguments that were set forth above, this study examined the following two research questions (RQs):

RQ1. Does SBI have positive instructional effects compared to TBI?

RQ2. What kind of perceptions do learners have on using core meaning and dictionary when learning polysemous prepositions?

4 Methods

This research conducted two studies consisting of an experiment that investigated the effects of instruction based on the CL approach, core meaning, and the leaners' perception about using core meaning and dictionary as a method of learning polysemous English prepositions.

4.1 Study one

4.1.1 Participants

A total of 88 Japanese learners of English participated in this study. All of the participants were university freshman majoring in English. They spoke Japanese as their L1 and had received formal English education for approximately seven to nine years by the time of the study. The participants took an English vocabulary class as a required course once a week and were assembled from four different classes. Based on the classes, they were divided into three groups, including two treatment groups and one control group. A result of one-way ANOVA, using the score of pre-test, showed that there was no significant difference between the three groups before instruction, $F\ (2, 85) = 1.601$, $p = .471$, $\eta^2 = .04$).

4.1.2 Tests

Two original tests, as pre- and post-test style, were created to measure the participants' knowledge of the target prepositions: *at*, *in*, and *on*. Two sets of different questions were used between the two tests. Each test consisted of thirty-six questions, divided into twelve questions for each preposition. The test was designed in multiple-choice style and the participants chose one appropriate preposition from three choices (Appendix A). Before practicing these two tests, they were analyzed by a parallel test method to confirm the homogeneity between pre- and post-tests. The result of the *t*-test was not significant, $t = 1.155$, $df = 33$, *ns*. Moreover, the two tests were moderately correlated, $r = .40$, $df = 32$, $p < .05$. These results suggested the homogeneity of these two tests, therefore the same two tests were used in this study.

4.1.3 Instructions and procedures

The types of instructional groups in this study were as follows. In schema-based instruction (SBI), there were two phases. First, pair task (categorizing-task) was carried out. Learners were given a task sheet including illustrations of the core meanings for each preposition. As options for categorizing, there were nine illustrations which showed the similarity using core meaning to make the prepositions easily imaginable to categorize and understand the relationship between core schema. The learners were then given another task sheet that was the same type as the previous one; however, there were nine options including illustrations of extended-use of each meaning of the prepositions. In a second phase, a teacher (author) explained explicitly how core meaning was utilized for semantic extension from core meaning to each use of preposition. The slides used in this phase are shown in Appendix B. It was assumed that this explicit instruction could give the learners a concrete understanding of how the senses are semantically related and how core meaning is used as a device for semantic extension depending on the similarity between core meaning and extended senses. After the SBI instruction, learners were given a handout that briefly summarized the contents of explicit instruction (Appendix C)[2].

In translation-based instruction (TBI), a study sheet was given to the learners by a teacher. The sheet consisted of the inventory of meanings with three usage types of the three prepositions (Appendix D). The instructor then proceeded to explain that the sheet was intended to provide a description in an English-Japanese dictionary. An assumption here is that one of the most general sources for learning polysemous words is translation by English-Japanese dictionaries[3].

Prior to the administration of the experiment, participants who agreed to take part signed consent forms. This study consisted of two testing sessions (pre- and post-tests) and the test time was 20 minutes for each. Participants were asked to take a pre-test before the instruction time, and not long afterward, a post-test was administered. The pre- and post-tests were then scored immediately after administration. After the post-test, data were analyzed with groups as an independent variable. The test scores were calculated using difference score and used as the dependent variable. In order to compare the effects of instructions, a one-way analysis of variance (ANOVA) was performed using PASW Statistics 24[4].

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[2] Illustrations used in SBI were from Ross & Maurice (1999), Tanaka et al. (2006), Tanaka (2007), Tanaka et al. (2008), and Tone (2005).

[3] Inventory of meanings in TBI were from Konishi & Minamide (2001).

[4] Part of the quantitative data is also used in Mitsugi & Nagashima (2014).

Table 1. Procedure of the Study One

SBI	TBI
Pre-test (20 min.)	Pre-test (20 min.)
Learning (30 min.) 1. Task 1 + Answer check 2. Task 2 + Answer check 3. Teacher's explanation 4. Learners' individual review	Learning (25 min.) 1. Providing study sheet 2. Teacher's explanation 3. Learners' individual review
Post-test (20 min.)	Post-test (20 min.)

4.1.4 Results

P-value of Levene's test was not significant ($p = .206$, $p > .05$), so the data for the first analysis showed homogeneity of variance, which was then used as the analysis for one-way ANOVA. Table 2 shows the mean difference scores using score and standard deviations for each group under all the conditions.

Table 2. The Mean Difference Scores and Standard Deviations for Each Group

SBI			TBI			Control		
n	*Mean*	*SD*	*n*	*Mean*	*SD*	*n*	*Mean*	*SD*
31	3.19	3.47	30	0.30	4.43	27	0.41	4.01

Table 3. One-Way ANOVA of Difference Between Each Group

	Sum of Squares	df	Mean Square	F	Sig
Between Groups	162.422	2	81.211	5.115	.008
Within Groups	1349.657	85	15.878		
Total	1512.080	87			

The ANOVA result in Table 3 presents that the effect of instruction type was significant, $F(2, 85) = 5.16$, $p = .01$, $\eta^2 = .11$. Since the effect of the instruction type was significant, a post-hoc pairwise comparison (Tukey method) was carried out. As a result, significant difference was found between the SBI group and the TBI group ($p = .02$, $d = .73$), and the control group ($p = .03$, $d = .75$); the difference score for SBI group was significantly higher than those for the TBI and control groups.

4.2 Study two

4.2.1 Participants

Participants' attributes are the same as Study One, although the number is different. A total of 15 learners participated in Study Two, and were sampled randomly from the SBI group. In Study Two, participants were asked to answer two questions in a questionnaire. The first question was, "Do you think it is easier to learn polysemous words by looking up each meaning in a dictionary, than it is to use core-meaning?" A 5-point Likert-scaled

questionnaire was provided in the first question such as “strongly agree,” “agree,” “neither agree nor disagree,” “disagree,” “strongly disagree.” The second question asked the reason for choosing the option in the first question and the answers were used as data for the qualitative analysis.

4.2.2 Method of data analysis

The data were analyzed with the Steps for Coding and Theorization (SCAT) proposed by Otani (2008, 2011) as a method of qualitative data analysis. The reason for employing this method was for suitability of the explicit analyzing process and small-scale data. The steps in this method are as follows: (1) extract key words from the original texts; (2) paraphrase them with other terms; (3) concepts from out of the text that account for step (2); and (4) create the themes or constructs in consideration of the contexts. The next procedure is writing a storyline with emerging key themes in step (4), and the last procedure is writing a theory from the storyline. Table 3 shows an example of the SCAT analysis of statements made by learner 1.

Table. 3. Example of SCAT Analysis

	Text	<1> extract key words from original texts
Learner 1	It's possible to remember the meaning of words through looking them up in a dictionary.	looking up the meaning of words / remember

Table 3. (continued) Example of SCAT Analysis

<2> paraphrases of <1>	<3> concepts from out of the text that account for <2>	<4> themes, constructs in considerations of context
learning procedure using dictionary / fix the word meaning to memory	Assuming the use of a dictionary as a method for learning polysemous words, which has been done conventionally.	a benefit in fixing the word meaning by memory through dictionary use

In this study, the analysis was interpreted by two researchers including the author. The storylines and theory writings were developed and discussed among the same two researchers. (Appendix E).

4.2.3 Results

The second study investigated learners’ perceptions about using core meaning as a method of learning polysemous prepositions, compared to using a dictionary. The question was “Do you think it is better to learn polysemous words by looking up each meaning in a dictionary than it is to use core-

meaning?" From the results of the 5-point Likert-scaled questionnaire, there were no participants who chose "strongly agree" nor "strongly disagree." 2 participants answered as "agree," and 6 participants answered as "neither agree nor disagree." The other 7 participants answered as "agree." In this question, "agree" means "it is better to use a dictionary to learn polysemous prepositions." On the other hand, "disagree" means "it is better to use core meaning to learn polysemous prepositions." Table 4 shows the constructs revealed from the results of SCAT analysis.

Table 4. Constructs of Learners Emerged from SCAT analysis

Participants who answered as "agree"	
Learner 1	a benefit in fixing the word meaning to memory through dictionary use
Learner 2	benefits in accurate learning through dictionary
Participants who answered as "neither agree nor disagree"	
Learner 3	effectiveness of dictionary-use in awareness and language-skill improvement in the process of learning through dictionary
Learner 4	perception on aptitude in both core-meaning and dictionary
Learner 5	suitability of core meaning to the prepositions which makes it easily imaginable, suitability of dictionary-use which provides concrete understanding of prepositions' meaning
Learner 6	necessity of separate-use depending on the situation
Learner 7	effectiveness of example sentences in the dictionary
Learner 8	effectiveness of example sentences in the dictionary
Participants who answered as "disagree"	
Learner 9	immediate understanding with core meaning-use
Learner 10	difficulty on understanding through numerous explanations in the dictionary / a clear-visualized image of core meaning / helpful in understanding the word meaning
Learner 11	high difficulty arises from complex explanations and example sentences in dictionaries
Learner 12	difficulty in understanding through numerous explanations in dictionary / a clear-visualized image of core meaning / helping understanding of word meaning
Learner 13	inefficiency of the learning through dictionary
Learner 14	much usage and possession of similar meanings that each preposition has / appropriateness of learning method as categorizing the words' meaning / necessity of elaboration on the use of each preposition using core meaning
Learner 15	difficulty arises from many usages of each preposition in the dictionary / efficiency in learning through core meaning

Learners who answered as "agree" perceived that utilizing translation in the dictionary was superior to core meaning. They recognized that using a dictionary has benefits of fixing the meaning of a word to memory, and also

provides accurate learning comprehension compared to the core meaning approach.

The perceptions among learners who answered as “neither agree nor disagree,” were divided into two types. The first type stood on the neutral point but insisted on the benefits of the dictionary. They perceived the benefits as being effective and enabling in terms of developing language skills. Also, the convenience of being able to utilize example sentences provided by the dictionary appeared to be very helpful in the learning process. On the other hand, the second-type of learners perceived aptitude in both core meaning and dictionary and the necessity of separate-use depending on the situation.

Learners in the "disagree" category referred to the disadvantages of learning through dictionaries by commenting on how the numerous explanations provided by the dictionary simply make things more complicated and harder to grasp. Therefore, the dictionary method appeared to be the more insufficient approach. Whereas, there were positive perceptions to core meaning such as the benefits in relation to being able to grasp the concept of the meaning. As well as the ease in the way of imagining, the learners recognized efficiency in learning through core meaning, possession of a clear-visualized image, helping learners' understanding smoothly, and the appropriateness of the learning method by categorizing the words’ meaning. Only one case mentioned indicated a problem in need of a solution concerning core meaning, which was the necessity of elaboration on the different usages that each preposition has. This is because each preposition has a variety of usages with very similar meanings.

5 Discussion

This study proposed two research questions while implementing one experimental study and one survey study. The first research question addressed whether the SBI has positive instructional effects or not, when compared to TBI. The result for RQ1 showed that SBI was more effective than TBI and the control group. From this fact, instruction using core-schema implied that it is effective for learning the polysemous English prepositions (*in, at, on*). A major difference in the instruction using core meaning and the TBI's inventory of meanings was utilization of the core-schema that runs through all its senses. In SBI, only one focal meaning was presented visually for each preposition, which suggests an assumption that the visual image encouraged a deep understanding of polysemous meanings.

Moreover, it seemed that the inventory of meanings in the TBI study sheet led to a considerable amount of confusion. In the TBI study sheet, there were descriptions which contained overlapping of meanings of each preposition as *-de*, *-ni,* and *-ni-taishi-te* in Japanese. In this case, the difference from other prepositions were not very prevalent. Therefore, it may

be suspected that learners in the TBI group may have been confused in selecting an appropriate preposition. In contrast, as for the SBI group, the meaning denoted by the visualized image, core-schema showed the difference with other prepositions notably. Thus, learners in the SBI were probably less confused by the overlapping of a meaning.

The result of RQ1 indicates that teachers who decide to implement core meaning into their classrooms, should depend not only on learners' intuitive understanding but also on the explicit explanation from teachers about interpretation. To put it concretely, teachers should explicitly provide students with a precise explanation about schematic core meaning, as well as the way of utilizing the concept of core meaning, and describing its motivations for semantic extension, while making sure to not just provide a core-schema. As Mitsugi (2013) reported, if teachers give their instructions only with easy explanation using core schema from beginning to end, their teaching will be insufficient for learners, which may cause the learners to have an unsuitable image of a word since interpretation and understanding of a meaning vary within learners. To avoid this, explicit explanation is considered necessary during instruction when implemented based on the core schema approach.

The second research question was proposed as "What kind of perceptions do learners have on using core meaning and dictionary when learning polysemous prepositions?" The second study used a questionnaire to answer this question, while answers were analyzed qualitatively. Through the analysis, the perceptions of the learners using core meaning and dictionary were revealed. Learners who preferred using the dictionary method perceived the benefits of dictionary-use to their accuracy in learning and fixing word meaning to memory, based on the comparison between dictionary and core meaning.

The other learners who were neutral perceived effectiveness of dictionary-use in awareness, language-skill improvement during the learning process, as well as the convenience of example sentences in the dictionary. The interesting aspect of this perception is that these types of learners perceived aptitude in both core meaning and dictionary and expressed the necessity of separate-use depending on the situation. For example, learning by core meaning seemed suitable for the prepositions which appear as easily imaginable, whereas learning by dictionary seemed suitable for the prepositions which are a little more abstract and difficult to grasp with imagination.

Learners who preferred using the core meaning approach perceived difficulty and disadvantages of learning through dictionaries. Including an inefficiency in the ability to grasp the words' meaning and a difficulty that arose from the complexity of numerous example sentences provided in dictionaries. In contrast to discovering difficulty due to numerous explanations in dictionaries combined with various usages, learners perceived

that the core meaning approach provides a clear-visualized image, which improves learning efficiency while enabling the learner to immediately understanding of the words' meaning intuitively. Furthermore, learners suggested that this particular learning approach was helpful in providing clarity in categorizing a words' meaning and elaborating on prepositions in their various forms of usage.

When combining the results of the two studies, we can conclude that there are suggestions leading to pedagogical implications. The core-schema approach proposed in this paper is more effective to Japanese learners of English for learning polysemous prepositions. However, teachers must consider that each tool, core meaning and dictionary, which were used in SBI and TBI, have both benefits and disadvantages. Moreover, there may be an aptitude in both dictionary and core meaning; therefore, they are better to be used separately according to the situation. In order to achieve this, teachers must have knowledge about several methods such as core meaning and translation by dictionary in order to teach polysemous prepositions effectively. This study has showed that SBI could be one of them.

6 Conclusion

This research implemented two studies to examine the effectiveness of two types of instruction for learning English prepositions (*in*, *at*, *on*) as polysemous words, and investigated how core meaning and dictionary were perceived as learning tools. The first study investigated the effectiveness of schema-based instruction compared to the instruction as inventory of meanings based on an English-Japanese dictionary. As a result, a positive effect was seen in instructions with core meaning, and besides, the visual image of core meaning (core schema) was possibly effective in avoiding confusion resulting from overlapping descriptions in the inventory of meanings. Moreover, a notable effect was shown in core-schema with explicit explanation about the concept of core meaning and semantic extension. From this fact, explicit instruction about core meaning and semantic extension is needed for learners to obtain a smoother acquisition of target prepositions.

The second analysis investigated leaners' perception on using core meaning as opposed to the classic dictionary method. According to the study, learning through dictionaries provides more accuracy in fixing the meaning of a word to memory. There is also other knowledge that can be acquired in the process of utilizing a dictionary. However, there were also learners who perceived disadvantages of using dictionaries in terms of a lack of efficiency, difficulty in understanding, and complexity caused by the abundance of context provided by dictionaries. Some learners also recognized that core meaning has benefits including the ability to grasp the concept of a preposition, as well as acquiring intuitive understanding through imagination.

In conclusion, there was an impressive perception which insisted an aptitude in each of the methods, dictionary and core meaning. Therefore, it is more effective for teachers to use both methods separately and according to the situation when teaching polysemous prepositions.

Although this study has shown that core meaning from the field of cognitive linguistics can work effectively as a pedagogical tool for learning polysemous words, there still remains much to be investigated. Considering that the experiment on prepositions reported in this study only dealt with a selected few, it can be concluded that much more research is necessary which targets other grammatical items as well, such as verbs, adjectives, articles in order to find more consistency.

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Appendix A
Sentences used in pre- and post-tests (*at*)

Test type	Sentences for *at*
Pre-test	Two lines meet ( ) a point.
	How many people were there ( ) the concert?
	They live ( ) 18 Victoria Street.
	( ) the top of the stairs, she paused.
	Cell-phones enabled people to communicate ( ) any time and any place.
	( ) Christmastime we always go to a lot of parties.
	Tea picked ( ) this time has an especially rich flavor.
	There was a big noise ( ) midnight.
	She was so mad ( ) me.
	How long have you been ( ) this job?

	Flowers are ( ) their best.
	The airplane is ( ) 10,000 feet.
Post-test	I feel sick ( ) stomach.
	I was ( ) a party with some friends.
	Alan lives ( ) 2608 Monument Avenue in Richmond.
	She sat ( ) the window.
	You can return unopened products ( ) any time.
	We believe you may need the details ( ) some future day.
	There is no special event ( ) this time of year.
	My husband often works ( ) night.
	He laughed ( ) me.
	I was delighted ( ) the news.
	Many children are still ( ) risk from neglect or abuse.
	He maintained his speed ( ) 80 kilometers an hour.

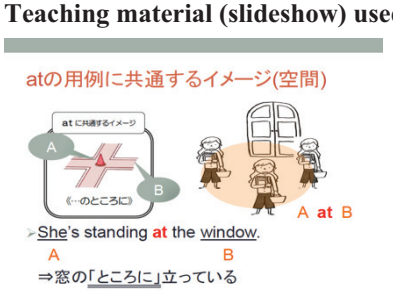
Sentences used in pre- and post-tests (*in*)

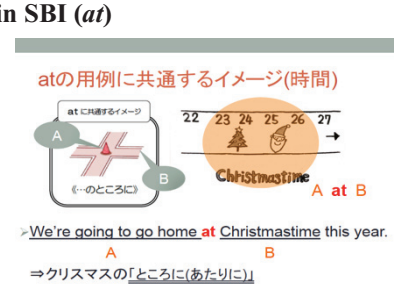
Test type	Sentences for *in*
Pre-test	He was dressed all ( ) black.
	The gift was wrapped ( ) the red paper.
	He took us for a drive ( ) his new car.
	There is an island ( ) the pacific.
	I usually get up ( ) the middle of the night to go to the bathroom.
	It was amazing how much we managed to do ( ) a day.
	We had the coldest winter ( ) 30 years.
	Our teacher is ( ) his twenties.
	There are twelve programs ( ) this series.
	He is ( ) the army.
	His life is ( ) danger.
	Only one ( ) ten of us will suffer from dementia.
Post-test	I feel warm ( ) this fur coat.
	He dipped his brush ( ) the paint.
	Manson spent fifteen years ( ) the prison.
	The sunset sets ( ) the west.
	I told the caller to phone again ( ) 24 hours.
	The people were crushed in the subway ( ) rush hour.
	The population has doubled ( ) the last five years.
	I'm becoming forgetful ( ) my old age.
	There is a room furnished ( ) the modern style.
	He was employed ( ) a large company.
	Long skirts are ( ) fashion.
	One ( ) ten homes now has cable TV.

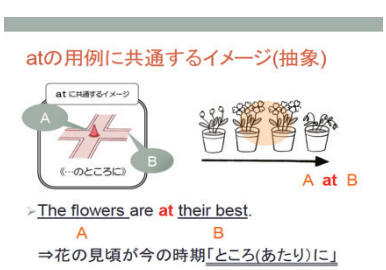
Sentences used in pre- and post-tests (*on*)

Test type	Sentences for *on*
Pre-test	I wanted to punch him ( ) the nose.
	The dress looks good ( ) you.
	There are many apples ( ) the tree.
	Pull the knob ( ) the door.
	He died ( ) the evening of June 29.
	Don't forget to get a present for your partner ( ) your anniversary.
	Will you meet me ( ) my birthday?
	Every woman wants to look her best ( ) her wedding day.
	You can contact me ( ) this number.
	There are some good points ( ) him.
	I believe that we are ( ) the right road.
	English has influence ( ) Japanese.
Post-test	He kissed her ( ) the cheek.
	He put a ring ( ) her finger.
	The baby was still ( ) the breast.
	Keep the door ( ) the chain.
	( ) the morning of September 11, 2011, four passenger jets we hijacked.
	He often drops in too see me ( ) Sundays.
	I don't want to go to work ( ) fine days.
	I stay at home ( ) a rainy day.
	We talked ( ) the phone.
	You shouldn't believe everything you read ( ) the newspaper.
	Unemployment is ( ) the increase.
	He was just too hard ( ) me.

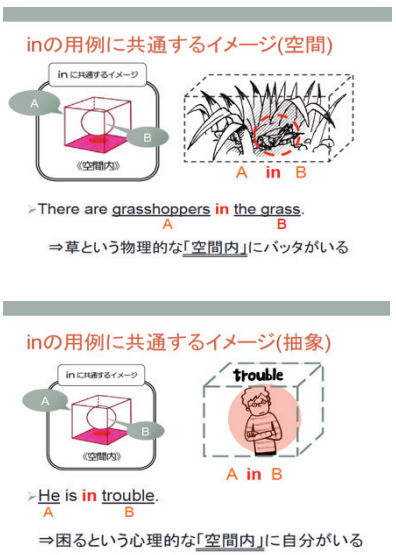
Appendix B
Teaching material (slideshow) used in SBI (*at*)

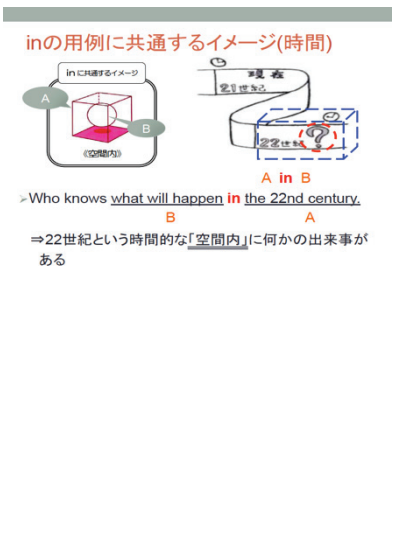




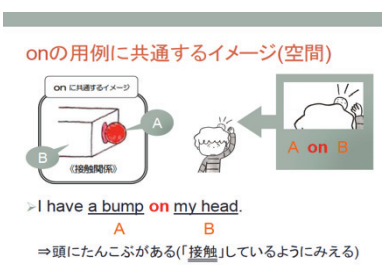


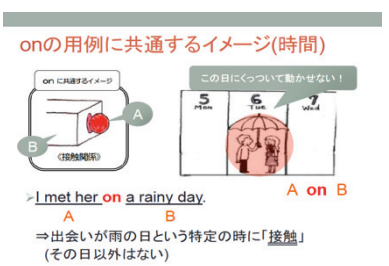
Teaching material (slideshow) used in SBI (*in*)

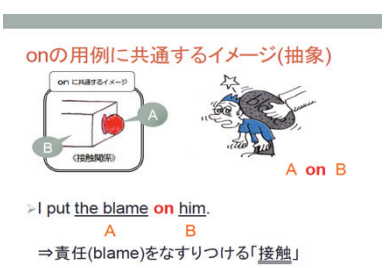




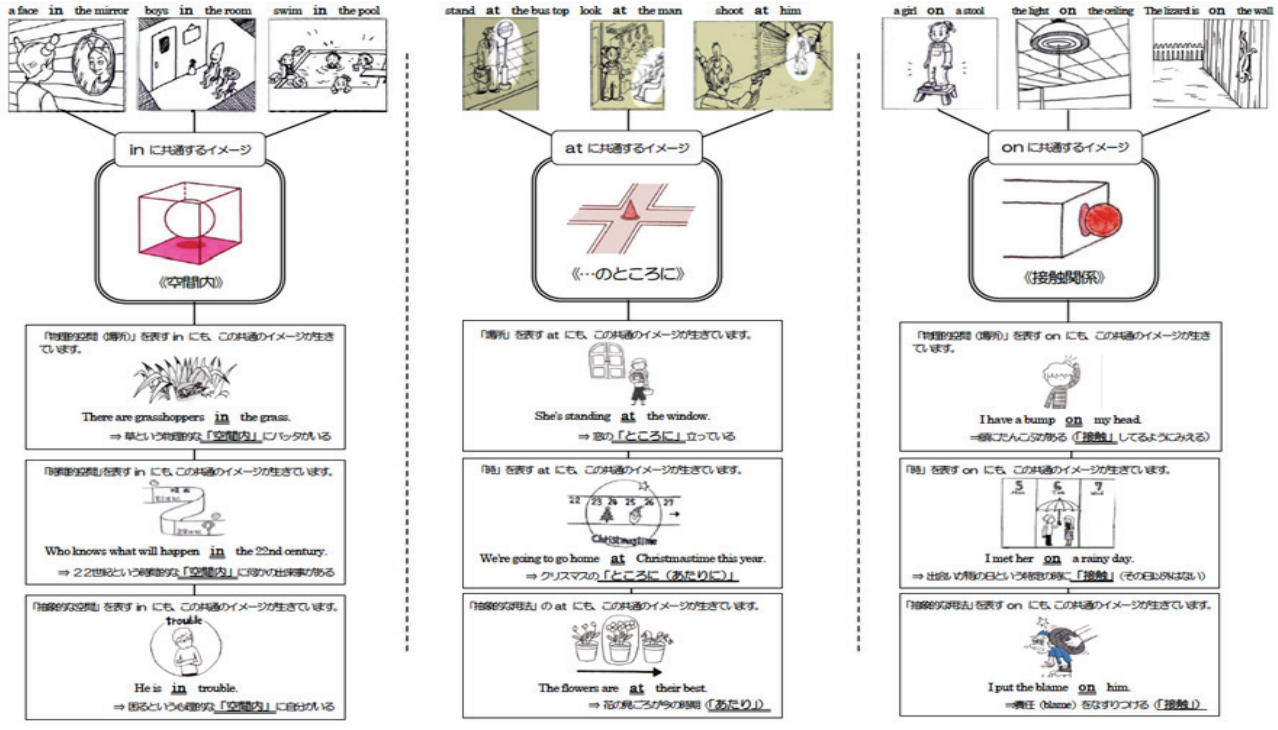
Teaching material (slideshow) used in SBI (*on*)







Appendix C
Teaching material (handout) used in SBI



Appendix D
Teaching material (handout) used in TBI

【in】

「場所」…の中に、…の中で(の)、…において、…で、…に
「時間」…のうちに、…の間に
「割合」…のうち(の)
「環境・状態・状況」…の中に、…の状態で

【at】

「地点・場所」…に、…で
「時間・年齢」…に
「方向」…に対して、…に向かって
「割合・程度」…で
「状態」…で
「原因・理由」…を見て(聞いて、知って)

【on】

「位置・場所」…で、…の上に、…に乗って
「時間」…に、…の時に
「手段・方法」…で、…によって
「運動の方向・動作の対象」…に対して、…の方へ
「関連」…に関して、…について

Appendix E
Storyline and Theory Writing Extracted from SCAT Analysis

Story-line	[Positive] - Based on the comparison between dictionary and core meaning, learners perceived the benefits of dictionary-use for accuracy in learning and fixing the word meaning to memory.
	[Neutral] - Learners perceived effectiveness of dictionary-use in awareness, language-skill improvement in the learning process, and example sentences in the dictionary. - Learners perceived aptitude in both core meaning and dictionary and the necessity of separate-use depending on the situation. Such as learning by core meaning is suitable for the prepositions which are easily imaginable, whereas learning by dictionary is suitable for the prepositions which are difficult to imagine the meaning.
	[Negative] - Learners perceived disadvantages of learning through dictionary, as an inefficient learning method, and described difficulty in the complexity of the example sentences. - In contrast to discovering difficulty due to numerous explanations in dictionaries combined with various usages, learners perceived that the core meaning approach provides a clear-visualized image, which improves learning efficiency while enabling the learner to immediately understanding of the words' meaning intuitively. - Leaners suggested that this particular learning approach was helpful in providing clarity in categorizing a words' meaning and elaborating on prepositions in their various forms of usage.
Theory writing	[Positive] - Learning through dictionary is more accurate and has a benefit in fixing the word meaning to memory.
	[Neutral] - There are some learner discoveries which have been obtained from the process of learning through using dictionaries. - There is an aptitude in each of the two methods, dictionary and core meaning, so they are better when used separately and according to the situation.
	[Negative] - Learning through dictionary has disadvantages in terms of a lack of work efficiency, difficulty in understanding, and complexity. - Core meaning has benefits including the ability to grasp the concept of a preposition, as well as intuitive understanding through imagination. - It is necessary to learn prepositions after doing concept rearranging because they have a lot of examples that resemble each other in meaning.

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