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Exploration into the Effects of the Schema-Based Instruction: A Bottom-up Approach*

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The purpose of this paper is to explore the effective use of the core schema-based instruction (SBI) in a classroom setting. The core schema is a schematic representation of the common underlying meaning of a given lexical item, and was first proposed on the basis of the cognitive linguistic perspectives by the Japanese applied linguists Tanaka, Sato and Abe (2006) as a new teaching approach. The SBI has been expected to contribute to English teaching in a new way that is different from the translation-based instruction (TBI) because the core schemas can lead learners to a more essential and profound understanding. However, the previous empirical research on the SBI has not always shown its effectiveness over the TBI. This paper firstly analyzed its causes with reference to the theoretical features of the core schemas and pointed out two kinds of difficulty for the effective use of the SBI. Then in order to get over the difficulties, it was argued that the SBI should involve a bottom-up language learning process, as insisted in cognitive linguistics as the usage-based model. As the bottom-up process, group work discussion was employed in this study, where learners discuss the core schematic image in a group with its sample sentences which were provided beforehand. This learning style is different from the top-down SBI, where the core schemas are provided prior to sample sentences as almost all the previous empirical studies did. The present study examined the difference in the effects between the bottom-up SBI and the top-down SBI through an experiment conducted to technical college students with the six English prepositions (*at*, *in*, *on*, *to*, *for*, *with*) as material. Based on the results of the former study by the researcher, the present study was designed to add some exercises to the bottom-up SBI group. The results obtained from *t*-tests and ANOVAs suggested several findings. The findings were that the bottom-up SBI is more effective than the top-down SBI in meaning comprehension and that the effect continues for two months.

Keywords: schema-based instruction, cognitive linguistics, core schema, bottom-up, group work

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1 Introduction

A lot of teaching methods for foreign language education have been proposed based on the research outcome from linguistics, psychology or pedagogy (Lightbown & Spada, 1999). Now that cognitive linguistics (CL) has become one of the most influential pillars in the linguistic research field, it is natural that a new teaching approach adopting the CL perspectives (i.e., CL approach) has been attracting a lot of attention recently. The CL approach basically argues that the cognitive process governing language use and linguistic knowledge is not essentially different from the other knowledge in mind (Langacker, 2008). Thus the CL approach provides us with new viewpoints that are different from those of the traditional translation-based instruction (TBI), and is expected to contribute to English teaching in a new way.

The present study focuses on how we can effectively apply the core schema to English teaching involving a bottom-up learning process in a classroom setting. The concept of core schema is based on the CL perspectives and was proposed for a teaching purpose by the Japanese applied linguists Tanaka, Sato and Abe (2006) to get over a situation where a lot of Japanese learners of English study its vocabulary through the rote memorization equating with a list of Japanese translations. In contrast to such traditional learning strategy, the core theory, which is a theoretical foundation of the core schema, takes a different viewpoint. It argues that several senses in a given lexical item are more or less semantically related with one another. To put in another way, there are several senses in one word because they were extended from a single core meaning, and did not arise randomly. That is to say, one form has one core meaning. The core schema is a schematized picture which represents the core meaning visually. Assuming each lexical item has a single core meaning, Tanaka et al. (2006) claim that introducing the core schema helps learners build their vocabulary and lead them to a better understanding and a longer period of retention because it provides the linguistic motivation between the core meaning and its multiple senses.

Their theory has become influential, and a lot of attention has been turned to its methodology, or how we can apply the core schema to English teaching. The empirical research, on the other hand, seems not sufficient enough to reveal whether the core schema really works effectively in a second language learning classroom, and more research is needed to assess it. Moreover, among the limited number of the empirical studies, most of them took a procedure of presenting the core schema to learners prior to providing concrete example sentences. In those cases, however, it is expected that learners accept the core schema as something inflexible that serves as a norm. However, as one of the most influential CL figures Tomasello (2003) argues, language is thought to be learned through a usage-based process and schemas are built with a lot of interactions with concrete examples. Thus, from a

theoretical view, the schema is thought to be a flexible and fuzzy notion which is gradually entrenched and changeable through a massive amount of input. As the core schema is based on the CL research outcome, it follows from this viewpoint that it should be presented to learners involving a bottom-up learning process. However, only few attempts have been made so far to apply the core schema to English teaching including a bottom-up learning process.

On the basis of the above situation, this paper focuses on exploring an effective bottom-up core schema-based instruction (SBI), and aims to propose what an effective bottom-up SBI is from the results of the current study as well as the previous studies by the researcher (Fujii, 2011a, 2011b, 2016). Specifically, the present study employs group work to include a bottom-up learning process as conducted in Fujii (2016). By making a group of four and giving learners sample sentences for discussions to consider their core meanings, the bottom-up learning process was prepared. Precisely speaking, this process is not usage-based in terms of the definition in CL (Tomasello, 2003), which is supposed to occur in the first language acquisition through a massive amount of input. However, compared with a procedure of presenting the core without any examples, it can be said that group work is one of the bottom-up learning styles that can be practicable under EFL (English as a Foreign Language) circumstances, where the same amount of input as the first language acquisition is impossible. The reason for adopting a four-people group is that all members would feel that they need to take part in a discussion, and thus they can learn further by working collaboratively than learning on their own (Sato, 2010).

This paper examines the effects on learners' comprehension and retention between the top-down SBI, where the core schemas were provided prior to sample sentences, as most previous studies did, and the bottom-up SBI, where sample sentences were provided first and then learners were instructed to consider the core meaning in a group before the core schemas were provided. Moreover, on the basis of the results of the former study in Fujii (2016), the present study was designed to add some exercises to the bottom-up SBI group, as is discussed in Section 1.2.

In the rest of Section 1, the key concepts in the present study, i.e., the core schema, core meaning, and core theory are explained with their definitions. Additionally, by reviewing the previous studies, the importance and the significance of the present study as well as why the problem of a bottom-up SBI deserves new research is discussed. In Section 2, the method of a classroom experiment for the purpose of exploring the research question is stated. The results are stated in Section 3 and the discussion follows in Section 4.

1.1 The core theory

The concept of the core as a teaching approach has been discussed by Tanaka et al. (2006) and considered to be appealing particularly in lexical representation because they appear to make a unique contribution to language learning. According to Tanaka et al. (2006), the core is the greatest common meaning that a given lexical item has in all its senses and the best exemplar of the usages. As in Figure 1, the core can be depicted as an apex of a semantic circular cone. The base of the cone represents the range of meaning. The larger the bottom area is, the higher the apex of a cone becomes, which means the core meaning becomes more abstract. Circles on the bottom of the cone represent context-sensitive individual senses and some of these are categorized under some of more abstract trans-contextual senses, represented as A, B and C in circle in the figure. These trans-contextual senses are rolled up together as core meaning. The premise of this theory is that even if a given word has many senses or many varieties of translation, there should exist a single abstract common core meaning underlying those senses.

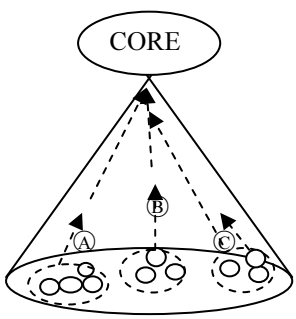

Figure 1. Core as an apex of a semantic circular cone (Tanaka et al., 2006)

Thus the core is context-independent and an abstract notion, and the meaning is decided as a result of context modification, giving out some senses represented as sense 1, sense 2, or sense *n* in Figure 2. Various senses in each word can be derived from a single core which serves as a semantic base.

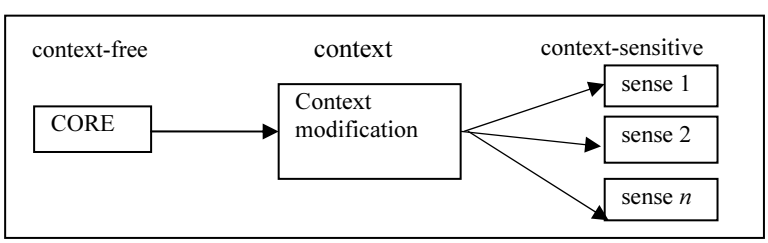

Figure 2. Core and context modification (Tanaka et al., 2006)

With regard to the mechanism as to how each sense is determined from the core through context modification, the polysemous verb *take* will be a good illustrative example. The verb *take* most probably means "swallow" in the sentence *John took some pills*. However, depending on the additional contextual information, the meaning of the verb differs as in the following sentences:

(1) John took some pills and got a stomachache.

(2) John took some pills and put them on the table.

(3) John took some pills and got arrested.

(4) John took some pills to his mother.

The sense of the verb *take* in (1) is probably "swallow," and the ones in (2), (3) and (4) would be "seize," "steal," and "carry" respectively. This indicates that the meaning of *take* is not fixed, rather, indeterminate. In other words, these examples show that the verb *take* has its core meaning, but each sense can change depending on each context, not the one that is determined on its own. These senses are fixed through context modification and "swallow," "seize," "steal," and "carry" are the examples of sense 1, sense 2, and sense *n* in Figure 2. According to Sato and Tanaka (2009), the descriptive core meaning for *take* can be made as "a movement of OBJECT into the HAVE space (prototypically by hand)," where the HAVE space refers to one's possessional space or territory. Thus, a word or word concept does not stand alone in isolation of other words or other concepts, but rather it is linked semantically with others to produce a semantic network.

As Tanaka et al. (2006) state, the concept of the core originally came from the idea "one form for one meaning and one meaning for one form" or "different forms, different meanings" by Bolinger (1977). Bolinger (1977) shows his view over the relationship between form and meaning as "[a] word form is not a container into which different and unrelated senses can be put randomly, but one which contains related senses." Tanaka et al. (2006) take this idea as their theoretical background and discuss that there should be a single underlying common meaning as long as a given word is expressed in the same form. This single underlying common meaning is referred to as the core meaning. On the basis of these features of the core, it has been expected to assist learners in a unique way in that it can provide a different way of teaching vocabulary from the traditional TBI or the rote learning.

The core schema refers to a schematic representation where its core image is depicted. The schema is intuitively appealing and learners can see the difference of the core meaning visually. For example, Tanaka, Takeda and Kawade (2003) show Figure 3 as a core schema for the verb *take*. This figure is a schematic representation for the core meaning of *take*, i.e., a movement

of OBJECT into the HAVE space (prototypically by hand). The core schemas are sometimes simplified for learners with a purpose of delivering the image to learners more directly. It is expected in teaching that the core meaning or the core schema may help learners understand polysemous words more essentially and intuitively and therefore retain the meaning for a longer period of time.

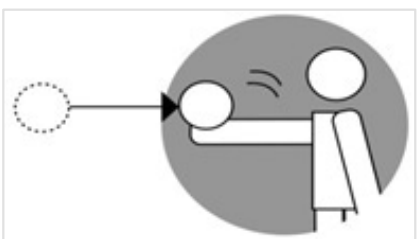

Figure 3. Core schema for *take* (Tanaka et al., 2003)

1.2 Literature review

Research on the effectiveness of the CL approach is mainly divided into two types, i.e., theoretical research (e.g., Littlemore, 2009; Tanaka et al., 2006; Tyler, 2008, 2012) and empirical research (e.g., Akamatsu, 2010a, 2010b; Boers, 2000; Cho & Kawase, 2011, 2012; Morimoto & Loewen, 2007). Research has been accumulated in both types, but in contrast to a lot of theoretical studies discussing its effectiveness and its methodology, the empirical research accumulation has not been sufficient in that the materials used in those studies have been limited in a few items such as prepositions or basic verbs (e.g., Akamatsu, 2010a; Cho & Kawase, 2012; Makni, 2014; Mitsugi, 2013; Morimoto & Loewen, 2007; Verspoor & Lowie, 2003; Wijaya, 2014) and phrasal verbs (e.g., Boers, 2000; Gao, 2011; Strong, 2013; Yasuda, 2010; Zoltán & Szabó, 1996). This may show that the CL approach is compatible with teaching ploysemous words.

Reviewing the preceding empirical research makes it clear that the theoretical contrivances from CL which has been applied to teaching can be divided into two main groups. The first group is to apply conceptual metaphor proposed by Lakoff and Johnson (1980) (e.g., LIFE IS A JOURNEY) or conceptual manipulations which motivates the semantic extension including metaphor or metonymy (e.g., Azuma & Littlemore, 2010; Boers, 2000; Deignan, Gabryś & Solska, 1997; Gao, 2011; Lazar, 1996; Yasuda, 2010; Zoltán & Szabó, 1996). The other group is to use the core meaning or the core schema[1] (e.g., Akamatsu, 2010a, 2010b; Cho & Kawase,

[1] Tyler and Evans (2004) and Wijaya (2014) use the term “proto scene” as almost the

2011, 2012; Fujii, 2011a, 2011b, 2016; Sato, 2015; Strong, 2013; Verspoor & Lowie, 2003; Wijaya, 2014). The research results from these two groups seem rather contrastive. That is, most of the studies in the former group have revealed its advantage over the traditional TBI (e.g., Azuma & Littlemore, 2010; Boers, 2000; Deignan, Gabryś & Solska, 1997; Yasuda, 2010; Zoltán & Szabó, 1996) whereas some of the studies in the latter group have not showed its significant benefits over the traditional TBI (e.g., Akamatsu, 2010a, 2010b; Fujii, 2011a; Morimoto & Loewen, 2007; Sato, 2015).

As the causes for the difficulty in applying the core theory, two kinds of possibility can be pointed out with reference to the features of the core theory. First, it requires a not-so-simple cognitive process for English learners to extract a correct sense through context modification. Figure 2 shows a cognitive process to give rise to several senses from a single core meaning, but this processing is all up to learners irrespective of their English proficiency level. Unless learners have stocked a certain amount of language resources in that language, it seems difficult for those who first encounter new usages to extract a correct or plausible sense even with the assist of context information. Due to the lack of language cues, learners can neither infer nor expect a sense from the core meaning. In this case, they cannot grab the semantic connection between the core and its senses. Consequently, even if the core schemas are provided, they have no choice but to memorize them as arbitrariness of language. This case is not essentially different from the rote memorization and cannot be expected to take advantage of the core theory.

The second possibility is that the core theory has its advantage in that the core meaning can represent all the individual senses even if they seem unrelated, but it is in this feature that learners feel hard to find the semantic connections between the core and its senses. This is especially the case with highly polysemous words since they are used in a variety of contexts and thus their core meanings become very abstract. The core theory has an advantage to deal with these high polysemous words very simply on the one hand, but it can be difficult for teachers to describe coherently a variety of senses from a single core meaning on the other hand. For the coherent descriptions, teachers' profound understanding in language and explanation skills will be required. This feature seems to make the core theory application difficult. If learners wonder why that sense can be explained from that core, then the effects of the core theory cannot be expected (Fujii, 2014).

Based on these two possible difficulties, the following two respects must be taken into consideration to apply the core theory to English teaching: providing sample sentences which include prototypical senses of target words in a simple context particularly for beginner-level learners who do not have enough language resources, and including a bottom-up learning process when

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same meaning as the core schema.

presenting core schemas to learners. In order to take advantage of the features in the core theory, the context in sample sentences should be simple enough to help them infer its senses. The process leading up to the core schemas from concrete sample sentences gives learners an opportunity to reflect on the semantic connections more consciously compared with the process where the core schemas are given just passively. In addition, the bottom-up process is, as mentioned before, more authentic and theoretically-sound in terms of the language acquisition perspective in CL.

Thus, although the core theory has great potential as a new effective teaching approach, the story would not be so simple to conclude that presenting core schemas alone leads learners to a better understanding and a longer retention as expected. This problem consciousness is based on several experiments which have been conducted so far by the researcher (Fujii, 2011a, 2011b, 2016). Since these studies have served as the base of the present study, brief descriptions for these studies are made in the following.

The study in Fujii (2011a) chose five modal verbs as material and conducted an experiment to investigate the effectiveness of the core schemas of the modal verbs. The participants were 16- or 17-year-old technical college students. The results suggested that presenting core schemas alone did not lead to an effective learning in comparison with the TBI. However, providing several sample sentences in addition to the core schemas of English modal verbs led to the results suggesting that the "core schema and sample sentence" SBI was significantly more effective in meaning comprehension of modal verbs than the TBI (Fujii, 2011b). The modal verbs, the core schemas and the tests used in Fujii (2011b) were identical in Fujii (2011a). The participants in both studies were students from a technical college, aged 16-17. The only procedural difference of these two studies is whether sample sentences were added to the experimental group or not. The results suggested that presenting the core schemas alone did not lead to an effective SBI and that some scaffolding, say, giving sample sentences, was necessary to enhance the core schema image.

Note, however, that both of these two studies provided the core schemas first and then sample sentences were given for the explanations on the semantic connection. In other words, the core schemas were provided in a top-down manner. The study in Fujii (2016) chose English prepositions as material and explored the effectiveness of a bottom-up learning process in the SBI. The participants were technical college students aged 16-17. For the experimental group, sample sentences were provided first in a form of handout and the learners were instructed to discuss what the core meaning of each preposition is by referring to the sentences in groups of four. A blank sheet of paper was provided to each group in the experimental group, and they were instructed to write on the paper their own core meaning for each preposition either in word descriptions or pictures. After the discussion and completion of their worksheet, the core schemas were provided in a form of

handout. For the control group, on the other hand, the same schemas were provided first and then the same sample sentences provided for the explanations on the semantic connections. The treatment time was set to take equally for both control and experimental groups. The results showed no significant difference between the two groups in their comprehension.

As this reason, it can be considered that some groups in the experimental group discussed collaboratively to seek for the core meaning and seemed to activate their knowledge making use of the form of group work. However, for some groups they seemed difficult to think out the core meaning, which was a new concept to most of them, and the discussion did not seem to be carried out actively. Any assistance was not made as necessary for these groups, which can be considered as a reason as to why the bottom-up SBI did not work effectively compared with the top-down SBI. For those learners who felt difficulty considering the core image, the only procedure that followed was the presentation of the core schemas without enough explanations due to the time limitation. Therefore, in order to make a bottom-up SBI more effective, the group work needs to be functioned more effectively. For more effective group work, some support will be required especially for those who feel difficulty.

From this discussion, it follows that the subsequent study needs to explore the effects of group work and some support, which will shed a light on an effective bottom-up SBI. The present paper hypothesizes that adding a few exercises after group work can be an effective bottom-up SBI in comparison with the top-down SBI in understanding and retaining meaning. Introducing exercises is considered to be a good opportunity to reflect on the core meaning (Tanaka, 2012). Therefore, the present study added some exercises after group work to the experimental group only, which was the only difference in the experimental design from the previous study in Fujii (2016). As for the exercises, learners were asked to choose the most appropriate preposition in the blank with reference to the core schemas. The design of this exercise was adopted from Tanaka (2012).

On the basis of this hypothesis, the research question to be explored in this study is as follows: Is group work followed by exercises an effective method as a bottom-up SBI for Japanese learners of English in comparison with a top-down SBI with respect to understanding and retaining the meaning of English prepositions?

2 Methods

2.1 Participants

A total of 83 students participated in this study. All the participants were Japanese technical college students majoring in engineering, aged 15 to 16, and they had received formal English education for approximately 3.5 to 5.5

years at the time of the study. The participants were from two classes and one class was served as the control group (CG) while the other was served as the experimental group (EG). The English proficiency level between the two groups was not statistically different based on the results of the B.A.C.E. (Basic Assessment of Communicative English) test, standardized English proficiency test with a full score of 300 that they took approximately five months before the time of the study. The average of total B.A.C.E. score of the EG was 197.9, and that of the CG was 190.4 (t (81) =1.03, p=.305). The scores indicated that the participants were beginner-level English learners. This study was conducted from September to November, 2014.

2.2 Materials

Six English prepositions (*at*, *in*, *on*, *to*, *for*, *with*) were chosen based on the textbook the participants used at the time of the study. The core schemas for the six English prepositions were excerpted from Tanaka (2011) as shown in Figure 4. According to Tanaka (2011), the descriptive core meanings for them are indicating a point or place (*at*), being in the space (*in*), touching something (*on*), facing something (*to*), starting or moving for something (*for*), and being with something (*with*). These schemas are simplified for an educational use but depicted to be intuitively delivered. The reasons why prepositions were chosen were that they are polysemous and that relationships between the different senses are in many cases overtly metaphorical and metonymic. Metaphor and metonymy are two of the basic processes of meaning extension in polysemous words (Verspoor, 2008) and can be predicted relatively easy to be dealt with for learners.

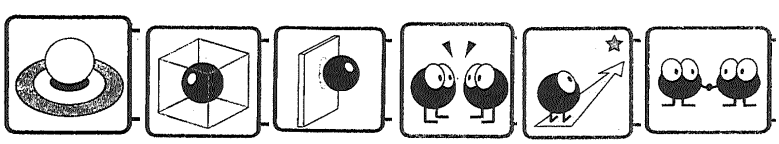

Figure 4. Core schemas of *at*, *in*, *on*, *to*, *for*, *with* (from left) (Tanaka, 2011)

2.3 Tests

The test used for this study consisted of 3 questions for each preposition, 18 questions in all and took a fill-in-the-blank style. One blank was provided for each of the 18 questions with the Japanese translations and the six prepositions were provided on the test sheet so that the participants could choose the most appropriate preposition to fit into each blank of the 18 sentences. The question items with the target prepositions and their sentences were chosen from the simple ones among frequently used phrases or

sentences on the TOEIC test based on Kawakami (2003). The following sentences in (5) and (6) are the examples of the test (see Appendix A for all the test items). The test was administered three times: before the experimental treatment (pre-test) to investigate the difference in their acquisition before instruction, right after the treatment (post-test) to see the influence derived from the different teaching methods, and two months after the treatment (delayed test) to see to what extent the influence of each instruction is retained. The three testing sessions were identical, except for a varying order in the presentation of test items.

(5) 空欄に氏名とｅメールアドレスを記入して下さい。
Fill (　　) the blanks with your name and e-mail address.
(6) 私はテイラー氏は信頼できると思う。
I think I can depend (　　) Mr. Taylor.
WORD BOX: at / in / on / to / for / with

2.4 Procedure and analysis

The study consisted of the following four stages: pre-test, learning, post-test and delayed test.

First, pre-test was administered to both CG and EG. No explanation about the test or the prepositions had been made in advance. The administration time was approximately 8 minutes. The answer sheets were collected without giving them the right answers or grading their test sheets at that time.

Second, right after the collection of pre-test, core schemas for the six prepositions (Figure 4) were provided along with each core descriptive meaning to the CG in a form of handout. After the explanation of what each core meaning represents, five illustrative example sentences for each preposition, 30 sentences in all, were presented to enhance their images. On the other hand, the EG firstly received the sample sentences, which were identical as the ones used for the CG, and then the participants made a group of four and were instructed to consider and discuss within a group what the underlying meaning each preposition has. They were encouraged to give any possible ideas that could lead to the core meaning and share them in their group. Through discussions they needed to look at and consider the sample sentences over and over again, which was aimed to serve as a bottom-up learning process. Then they were instructed to write the core meaning on a sheet of paper either in words or pictures. After the discussions, the same core schemas as the CG were provided in a form of handout. Then a sheet of exercises (see Appendix B) was also provided and instructed to do the

exercises working in a group, referring to the image of the core schemas provided. The exercises consisted of the six fill-in-the-blank format questions based on Tanaka (2012), and the learners were asked to choose the most appropriate preposition for each blank. The sentences used in the exercises were different from the ones in the tests. The treatment time after pre-test was adjusted to take approximately 30 minutes for both CG and EG. This means that the CG learners have a longer period of time in receiving an explanation about how core schemas semantically connect with each sense and reviewing on their own while the EG learners needed to discuss the core meaning and do the exercises in the allocated 30 minutes. The procedural difference between CG and EG was that the core schemas were provided in a top-down way to the CG, while the core schemas were provided after group work discussion and the exercises were given to the EG.

The present study was designed based on the results of the former study in Fujii (2016), where no significant difference was observed between the top-down SBI and bottom-up SBI. The only procedural difference from Fujii (2016) was that the exercises were added to the EG, and in order to perform the exercises, the time allocated for group work discussion was shortened to approximately 20 minutes while all the allocated time was consumed for group work discussion in the former study. All the other materials and tests were identical. The participants were from the same technical college, and their ages were almost the same. If this experiment showed any significant differences, it seems possible to suggest that the effects were ascribed for the most part to employing exercises.

Third, post-test was administered to both groups right after this treatment. The administration time was approximately 8 minutes and the learners graded their answers with their partners.

Fourth, delayed test was administered to both CG and EG for about 8 minutes two months after the treatment. They graded their answers with their partners. After the treatment until delayed test, no special instructions about the targeted prepositions, say, referring to the core schemas or reminding the core meaning, were made to both CG and EG. Table 1 shows the brief procedure of this study.

Table 1. Procedure of the Study

CG	EG
Pre-test (8 min.)	Pre-test (8 min.)
Learning (30 min.) 1.Providing core schemas 2.Providing sample sentences 3.Teacher's explanation 4. Learners' individual review	Learning (30 min.) 1.Providing sample sentences 2.Group work 3.Providing core schemas 4.Exercise
Post-test (8 min.)	Post-test (8 min.)
(two months later) Delayed test (8 min.)	(two months later) Delayed test (8 min.)

With regard to the analysis, one point was given for each correct answer, and the total possible score was 18 for each test. In order to compare the relative effectiveness of the CG and the EG on the comprehension and retention of L2 English prepositions, *t*-test was performed with the test scores. In order to analyze the difference of the three test scores within each group, one-way analysis of variance (ANOVA) was performed. The alpha level was set at .05 for both of the statistical analyses.

3 Results

Table 2 shows the descriptive statistics of the pre-, post- and delayed test scores between the two groups.

Table 2. Descriptive Statistics of Pre-, Post-, and Delayed Test Scores

	M(*SD*)		
	Pre	Post	Delayed
CG (*n*=40)	9.85(2.18)	12.75(2.75)	10.70(2.16)
EG (*n*=43)	9.45(2.38)	14.57(2.10)	11.10(2.71)

On post-test, the EG is about 1.82 point higher than the CG in its mean value, which leads to a statistically significant difference between the two groups (t (72.78) =3.30, p=.002). On delayed test, the mean value of the two groups got closer again, and any significant difference was not detected (t (81) =0.77, p=.444).

With regard to the statistical difference among the pre- post- and delayed tests within each group, according to the results of one-way ANOVA, the significant difference was detected in both CG (F (2, 117) =15.67, p<.001) and EG (F (2, 126) =49.89, p<.001). According to the results of multiple comparison, it was found that the differences between pre- and post-tests, and between post- and delayed tests were significant in the CG, whereas the differences between pre- and post-tests, between post- and delayed tests, and between pre- and post-tests were significant in the EG. Although the difference between the CG and EG was not significant with regard to the delayed test scores, the difference between the pre- and delayed test scores were significant only in the EG.

4 Discussion

From the results in Table 2, it was suggested that when teaching English prepositions to Japanese technical college students with core

schemas, employing group work combined with exercises was more effective in meaning comprehension than presenting schemas in a top-down manner. It was also suggested from the results of ANOVAs that this effect continues, though barely, for two months if they learned in group work followed by exercises while the effect does not continue not longer than two months if they were taught in a top-down manner.

With reference to the previous study in Fujii (2016), whose procedural difference from the current study was whether exercises were adopted or not, it may be suggestive that in order to promote the core schema image, even if group work is employed and a step of considering the core meaning is incorporated, some support will be necessary for everyone including those who feel difficult to think out the core meaning on their own. For example, providing exercises to reflect on the core schema or core meaning would be an effective support to benefit from the core theory. Additionally, in the current study, the time allocated for group work discussion was shortened to about 20 minutes from 30 minutes in the former study, and approximately 10 minutes were consumed for the exercises. Despite of the shorter-time group work discussion, the significant difference was observed on post-test between CG and EG in the present study. From these results, it can be suggested that the exercises may have helped learners whose group discussion had sometimes stopped because of the difficulty. For those learners who felt quite challenging to think out the core meaning on their own, the exercises may have been a different chance to resume their work in a group. That is, exercises may have served as support to grasp the core meaning as well as an opportunity to reflect on the core schemas more consciously. The suggestions here are of significance in applying the SBI in a conventional classroom setting, where various students at a various proficiency level are learning. While there are some learners whose English proficiency level is quite high, there are also some learners who need some scaffolding in the same classroom even though they are learning the same material with the same explanations by a teacher. Group work may be one way to function as scaffolding because learners have a chance to learn from others through discussion and verbalization (see Appendix C as examples of a group who worked collaboratively). Moreover, the time consumed for group work discussion and exercises was 30 minutes. This means that the “group work and exercise” SBI is practicable within one normal English class time in Japan, which is in most cases around 50 minutes. This practicability is a very important factor in applied linguistics too.

However, the limitations of this study have to be acknowledged. First, the present study dealt with only limited usages of the only six prepositions. It must be noted that this study showed one possibility of suggestion and the results must not be overgeneralized to the discussion of all prepositions. It goes without saying that more follow-up studies will be required to verify the effects from various respects. Second, the present study treated only basic

usages of prepositions in a simple context based on the discussion made in Section 1.2. The effects of a bottom-up SBI on peripheral usages, which are semantically distant from the core meaning, need to be pursued in the future research. Third, part of discussion was made along with the results of the former study (Fujii, 2016), but as the participants were different, the suggestion obtained from these studies should not be interpreted too affirmatively. However, as the experimental procedure was identical except for the process of the exercises, it would not be too affirmative to derive a suggestion from the results of the two studies, and the discussion was made from this viewpoint.

The present study has revealed that the bottom-up SBI incorporating exercises is more effective than the top-down SBI. This is the most important finding in the present study. Additionally, with reference to the former research results, the effectiveness of introducing exercises in a bottom-up SBI is suggested. However, more follow-up studies are required for verification of this new teaching approach.

5 Conclusion

The previous research has revealed that the CL approach employing core schemas, or the SBI, was not always more effective than the TBI. It was pointed out in the present paper that this cause could reside in the features of the core theory. The two possible features that make the application difficult are the difficulty in fixing a correct sense through context modification and the difficulty in finding semantic connections between the core and its senses. In order to get over these difficulties in the SBI, it was argued that the bottom-up learning process should be involved in order to conform to the theory of CL instead of a top-down learning process as the most preceding studies did. As a bottom-up process, group work discussion was adopted in the former study, but the significant effectiveness was not observed comparing with the top-down SBI. Since a bottom-up SBI is a research field that has been unexplored, with a view to proposing an effective bottom-up SBI, the present study examined to explore the research question: Is group work followed by exercises an effective method as a bottom-up SBI for Japanese learners of English in comparison with a top-down SBI with respect to understanding and retaining the meaning of English prepositions? The answer to the research question was yes.

To conclude, this study despite its limitations contributed to widening the horizon of the SBI. The combination of group work and exercise may help to serve as one of the effective uses of the bottom-up SBI and as a milestone to pursue a more effective SBI that is practicable in a classroom setting.

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Appendix A

Test Items Used for Pre-, Post-, and Delayed Tests

All the test items are accompanied with their Japanese translations.

at / for / in / on / to / with

1. Is this the file you were looking (for)?
2. I will be in London for (at) least three days.
3. How do I get (to) the train station?
4. Let's start our next meeting (on) time.
5. Are you waiting (for) someone?
6. We will send you free, along (with) your purchase, a pocket size World Atlas.
7. I have been working (on) a research project in Egypt for five years.
8. I look forward (to) your reply.
9. (In) addition, you'll get special days off for paternity leave.
10. This offer expires (at) the end of this month.
11. This book is filled (with) pictures and interesting facts about wild animals.
12. He'll be back (in) time for the party.
13. That striped shirts goes well (with) the gray pants.
14. (At) times I wish I could just quit my job and go to Tahiti.
15. Have you handed (in) the budget request for next year?
16. He took off his old tie and put (on) a new one.
17. Who is responsible (for) this shipment?
18. All my life, I looked up (to) him.

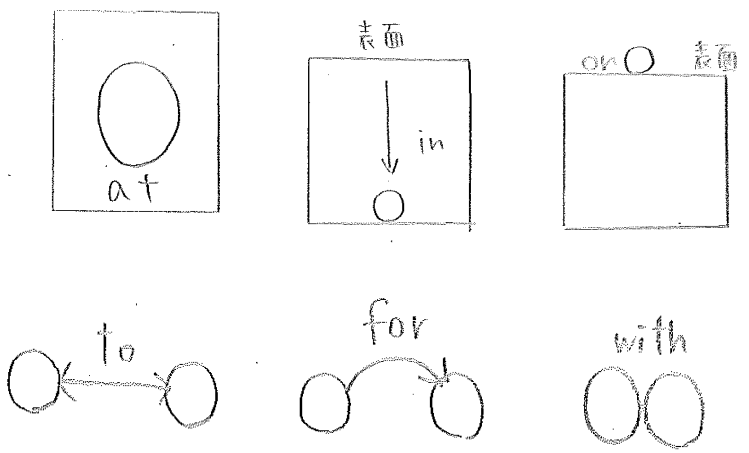
Appendix B
Exercises Used for the EG

All the items are accompanied with their Japanese translations.

1. I'll leave (for) the airport by 3:30 p.m.
2. Fill (in) the blanks with your name and e-mail address.
3. It was the first time I met him face (to) face.

4. She was standing (at) the top of the stairs.
5. The mountain is covered (with) snow.
6. The game player is now (on) sale.

Appendix C
Samples of the Core Schemas Drawn by the EG Learners



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