Empirical Research on the Semantic Structures of Basic Polysemous Japanese Verbs and Adjectives, and their Acquisition and Education

1. Background and purpose of this research

The purpose of this research is to investigate the semantic structures and the acquisition of basic polysemous Japanese verbs, and to apply these results to the vocabulary instruction and material development of the learners' dictionary. The purposes of this research are as follows:

1) to uncover the semantic structures, including their central meaning, the network structure of meanings, and the extensive relationships between their meanings, of polysemous verbs by using various experimental methods and extensive corpora.

2) to shed light on how meanings of polysemous words are described in Japanese dictionaries, such as order and categorization of meanings.

3) to investigate how learners of Japanese as a second language (L2) acquire the basic polysemous verbs.

This research was commenced when I was asked to edit a learners' dictionary of polysemous words by a publisher. As a result, a noun edition, an adjective and adverb edition, and a verb edition were published by 2012, and thereafter, Taiwanese and Thai editions, as well as an electric edition, were also published in succession. The semantic structures of words appeared in these dictionaries, however, were analyzed by researchers' introspection, so the objectivity of the analyses is not guaranteed, and further research is needed.

The semantic structures drawn in this learners' dictionary are based on research, but various devices like those below, were adopted for learners to utilize usefully and efficiently as material for educational purposes.

1) In order to simplify the network structure of polysemous verbs, all extensive meanings except for secondary extensive meanings are drawn as being extended from the most important, central meaning.

2) When explaining the motivation of each meaning extension, technical terms such as "motivation", "metaphor" and "metonymy" are not used.

3) Image schemas, which are too abstract for learners to comprehend, especially if their level is not so high, are not employed. Instead, illustrations, which are not so high in abstraction, are adopted to show their meanings in a visual way. The illustration for each meaning has something in common, and the similarity is emphasized enough to allow learners to draw one abstract image schema for each word by themselves. For instance, all illustrations of the verb "KIRU (= to cut)" highlight the common

image of "dividing a long continuous thing by adding power".

On the other hand, from the aspect of research, Moriyama (2012a), which deals with the semantic structure of a Japanese verb, "KIRU", was the first step of this project. However, this study also had the limitation of using the introspective method for analyzing the semantic structure of the verb. As a result, several research questions arose as follows:

1) What are the strengths and weaknesses of the introspective method?

2) If the introspective method has any limitations, what kind of method complements it?

3) Are the methods which were used to analyze and describe the meanings of the verb "KIRU" available to analyze and describe the semantic structures of other verbs?

4) How do the semantic structures of the verbs influence their acquisition as a L2?

5) In addition, how do the corresponding words in the learners' first language (L1) influence their L2 acquisition?

6) On the basis of these issues of discussion, what is the significance and what are the problems of the learners' dictionary published in 2012?

The first to third points are issues for analyzing the semantic structures of verbs, the fourth and fifth pertain to acquisition research, and the sixth is an issue for language teaching research.

In order to answer these questions, this research project was launched from the academic year of 2013. The purpose of this project has been mentioned above. At the beginning, we planned to address as many and various verbs and adjectives as possible. However, although a wide-ranging study can derive generalized answers on the one hand, it can reduce the preciseness of these answers on the other. Therefore, we narrowed our research policy to verbs only, as well as refining the number of verbs to be dealt with in order to increase the quality of the analyses. In addition, we aimed to develop effective methods for the semantic analyses of various verbs. Consequently, we addressed only six Japanese verbs, accompanied by not only the auxiliary verb "TE-KURU", but also one English and two Korean verbs. Using these verbs, we conducted research into their semantic structure, comparative studies, and learning or teaching research.

2. Semantic structure research

Although research on the semantic structures of words initially adopted the introspective method, a problem began to arise in that it was easily biased by the researcher's subjectivity; to guarantee objectivity became an issue. As a result, more attention was drawn to finding alternative methods to compensate for this, such as the experimental methods and the corpus analyses.

However, because the procedure of the experiment and the participants' attitudes may exert an influence on the result, there are also limitations to the experimental method, and it seems difficult to compensate for the shortcoming of the introspective method. In other words, both have not only strengths but also weaknesses, and so in order to uncover the semantic structures, it would be desirable for both of them to complement each other to minimize the effects of the weakness. If this is true, the introspective method also has to improve its methodology further, so as to enhance the objectivity of the analysis.

In addition, the introspective method often uses examples made by the researchers themselves,

and generally speaking, it would be impossible to cover all usages of a word in various contexts. Moriyama (2012a), who triggered this research project, was also limited in not covering the comprehensive usages of a word. On the other hand, regarding the experimental method, the more the usages were employed, the greater the burden imposed on the participants. Then, the researcher has to limit the number of the usages used per experiment. For these reasons, it would be difficult for both methods to cover all the usages in various contexts, and another method, the corpus-based analysis, would be effective because various usages in various contexts are addressed by the method. In Moriyama (2017a), he investigated the semantic structure of the Japanese verb "KIRU" by using a corpus, and revealed that the verb has a total of almost 50 meanings, including one central meaning with 14 sub-categories, and 12 extensive meanings, with 23 sub-categories. The number of meanings in this study was much more than the number in Moriyama (2012a), which used the introspective, as well as the number in Moriyama (2015), which used the experimental method. Moriyama (2017a) revealed the availability of corpus-based research, as well as the continuity of the meanings of the verb. In other words, the boundaries of meanings are fuzzy and continuous in relation to the neighboring meanings. Consequently, when analyzing the semantic structure of a word, more methods should be employed to compensate for the weaknesses of the other.

In addition, because each verb extends its meanings differently word by word, more attention should be paid, and various frameworks may often be needed when you analyze their semantic structures. For example, in Moriyama (2016a), which addressed the semantic structure of the Japanese verb "AGARU (=to go up)", the framework of "orientational metaphors" proposed by Lakoff (1980) would be useful in analyzing its semantic structure. This is because this framework deals with metaphors from the spatial to non-spatial domain, and the motion verbs that express a movement including moving up and down, forward and backward, and inside and outside, possess various meanings that were extended from the spatial and central meaning to non-spatial and metaphorical meanings. The framework of Lakoff's "idealized cognitive model" would also be useful when analyzing these motion verbs, since they all have both the usages of animate and inanimate motions, as well as both usages that focus on the goal of a motion and the other than the goal. By adopting his model, you can address these three factors, space versus non-space, animate versus inanimate and goal versus non-goal, all at once. The idealized cognitive model was also employed in Moriyama (2016), which analyzed the semantic structure of the verb. In his research, the prototype and central meaning is the one that expresses spatial, animate and goal-focused movements, and in other non-prototypical meanings, at least one of the three is extended in meaning.

In Moriyama (2017b), he reviewed studies on semantic structures of Japanese verbs according to the framework of Moriyama (2015), and revealed the structural commonalities and the differences. According to him, since the meaning of a verb is in close relationship with its co-occurring arguments, it would be generally essential to describe the meanings of a verb paying attention to the argument structure; nevertheless, how the meanings are extended differs word by word, so it should also be important to take these differences into account when analyzing the meaning structure of a verb.

For instance, transitive verbs that express concrete motions, such as KIRU, UTSU and HIKU, co-occur with a noun phrase of patient as their objects; however, there sometimes co-occur noun phrases

that express participants other than the patient; moreover, the result of the motion can even also co-occur as their objects in terms of perspective shifts.

Perceptions, on the other hand, usually occur along with other actions; therefore, perception verbs, such as MIRU (=to see), have various extensive meanings that express the actions co-occurring with the perception. For example, "watching TV" means not only looking at a TV screen, but also enjoying the program that appears on the screen, so "Terebi-wo miru (= to see TV, in literal meaning)" means "to enjoy a TV program". Therefore, when you analyze the semantic structures of these verbs, it will be essential to pay special attention to these points.

Furthermore, Cho (2015a) dealt with the semantic structure of the Japanese auxiliary verb "TE-KURU", as well as a corresponding Korean verb "A/EO-ODA".

3. Comparative studies

Related to the research on second language acquisition, comparative studies comparing the learner's second language with their first language, were also conducted (Cho, 2015b; Park, 2017).

4. Second language acquisition studies

Furthermore, studies on L2 acquisition were conducted, such as Zhong (2015) and Yamasaki (2015), but they were not sufficient enough to explore the process and the mechanism of L2 acquisition, especially the relationship between acquisition and various factors, including prototypicality and the influence of learner's L1. This must be solved in future studies. Zhong investigated the relationship between the prototypicality of each meaning, and its acquisition order, using the Japanese verb "KIRU". According to her, the correlation coefficient between the prototypicality and acquisition (receptivity) was 0.695, which indicates moderate levels of correlation coefficient. According to her, this result indicates that the acquisition of meanings can considerably be explained by means of their prototypicality. However, her study ignored the influence of the learners' first language. If the corresponding Chinese verbs "JIAN" or "QIE" have a similar semantic structure to the Japanese verb "KIRU", the influence of the learners' L1 also relates to the acquisition. My later research, which explored the multiple regression coefficient among prototypicality of the meanings of the L2 word "KIRU", the influence of L1 verbs "JIAN", and acquisition, revealed that the coefficient of L2 prototypicality was 0.36, and coefficients of the L1 verbs "JIAN" and "QIE" were 0.41 and 0.16, respectively. This indicates that the acquisition order was influenced not only by the prototypicality of each meaning of the L2 verb, but also the influence of the corresponding L1 verb(s). However, there were not enough usages and participants to get significant results. Further research, using more usages and participants, will be needed to make the process and mechanism of the acquisition clearer. Moreover, research, using participants whose L1s are other than Chinese, will also be needed.

Yamasaki investigated the difference in the semantic structures of the English verb "CUT" between English native speakers and Japanese learners of English. As a result, the categorization of learners was more obscure than that of natives, which indicates that the semantic structure, especially the relationship between usages, was not clearly established, and that the learners' L1 may influence on categorization.

Furthermore, the acquisition of the Japanese auxiliary verb "TE-KURU" was also investigated in Cho (2015a).

5. Second language teaching studies

Finally, as a researcher on second-language teaching, I investigated the material analysis using a learners' dictionary of Japanese polysemous verbs published in 2012. This dictionary paid considerable attention to learners' comprehension and employed various techniques from the cognitive linguistics perspective already mentioned above. For example, a network diagram was used to display the semantic structure of each word. Technical terms, such as motivation, metaphor and metonymy were not used for the user to comprehend easily; instead, the relationship between a meaning and its extensive meanings is explained in popular language. Illustrations are also employed in order to imagine each meaning visually, as well as abstract super schema from all meanings of each word. By using these techniques, users are able to learn the whole meaning structure with less of a cognitive load.

However, whether these techniques are really available for learners and teachers is yet to be confirmed. For this reason, I conducted a monitoring investigation in three language speaking environments, including Korean, Chinese and English. As a result, the techniques adopted in this dictionary from the perspective of cognitive linguistics, including network diagrams, image schemas, descriptions about the relation to superior meaning, cultural notes and usage notes, were generally esteemed positively by the users. However, these estimations were different according to whether the user was a learner or a teacher, and if he/she was a learner, what his/her learning level was, what his/her first language was, whether this dictionary was used as a dictionary or a textbook, and various other factors (for details, see Moriyama, 2017c).

6. Conclusion

In sum, this research project revealed several conclusions as follows:

Although various methods, including the introspection, the psychological experiments and the corpus analysis, were used to analyze the semantic structures of polysemous words, all of them possesses limitations. Therefore, in order to increase preciseness in our findings, we should use more than one method to compensate for the weaknesses of any one given method. In addition, we dealt with only a small number of verbs in the current project, and so further research, using a greater variety of verbs, has to be conducted to derive generalized answers in the near future. Moreover, the establishment of more sophisticated methodologies will also need to be developed.

In using the psychological experiment, more attention should be paid not only to selecting the sentences where the word is used, but also to deciding how many sentences are to be used. How to present these sentences should also be carefully considered. Furthermore, the number of usages which can be addressed in the experiment at a time has a limit, so we have to narrow down the number of usages used in an experiment in advance. Since some of these issues might be impossible to overcome, we have to use other methods to compensate for these constraints. By dealing with only a part of a word's usages, we may be able to maintain the quality of the experiment.

In addition, by employing the corpus analysis, we may be able to more objectively classify usages with their contexts in mind. However, how these usages should be categorized is another difficult problem. There are two ways, one of which is a way in which usages are classified using the introspective method. However, with this method, the researcher's subjectivity can enter into the analysis as a bias.

There is another way which involves using the tagged corpus, where all words are mechanically tagged beforehand, and so, usages can be classified without the researcher's subjectivity. However, tags are also attached by a person, so his/her subjectivity cannot be removed from the analysis completely either. Moreover, there is no guarantee that the classification made by the tagged corpus is identical to the classification made by people.

Cognitive linguistics is based on the prototype model of categorization, which is different from the classical model. The latter regards a category as being defined by the total sum of the semantic features; instead, the former considers that a category is established by centering on a prototype member, where all other members bear some similarity to the prototype member. In a sense, similar to the classical view of categorization, categorizing a word's usages by means of the tags attached to each usage classifies them mechanically in terms of whether or not a usage possesses semantic features represented by the tags. Therefore, it may be difficult to consider that the classification in terms of a tagged corpus corresponds with the categorization made by human beings, where categorization centering on a prototype would possibly be established.

Secondly, when you conduct a L2 acquisition study, not only the prototypicality, but also the other factors, such as the influence of the learner's L1 in particular, have to be taken into account. As far as this issue is concerned, it would be desirable that for further studies, using participants whose L1 is different from the previous studies is key.

Thirdly, suggestions for the L2 teaching should be proposed based on L2 acquisition research. The suggestions also need to be confirmed through empirical studies. The current project conducted a study by asking Japanese learners or instructors to using the learners' dictionary as a monitor for three months, and interviewing them about what they thought about the strengths and weaknesses of the dictionary were. In the future, more objective methods, such as settling a control and experimental group to distinguish the differences in the effectiveness between the two groups in a quantitative way, should be used. In addition, although cognitive linguistics advocates that a language be acquired through a usage-based and bottom-up process, from concrete usages to abstract grammatical or syntactic rules, and that it should employ data-driven, usage-based methods, most of the studies have been conducted in a theory-based way and not empirically, using usage data such as corpus. So further empirical studies must appear in the future.