A Case Study of Developmental Process in L2 Vocabulary Acquisition: Image Schema, Inference and Integration of Concepts in the Mental Lexicon.

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Abstract

In the field of bilingual studies, various hypotheses on the L2 mental lexicon are proposed. In some models, the structure of the mental lexicon consists of concepts and words, or signs. (De Groot, 1995; Kroll & Stewart, 1994; Dong, Gui & MacWhinney, 2005). Dong et al. proposed the shared asymmetrical model on L2 mental lexicon, suggesting that L2 learners should integrate the conceptual differences between two languages in the process of acquiring the other vocabulary. Hence, when we think about vocabulary acquisition, we have to take into consideration conceptual structures in the mental lexicon and of lexical acquisition process.

The purpose of this study is to examine how the mental representations of basic English verb, *come*, in the mental lexicon of the second language learners of English change by stimulating inference. The participants were Japanese university students who have learned English more than 6 years. Two experiments were conducted. In the experiments, sentences of *come* with various usages (central and peripheral usages) were used. Experiment 1 examined the participants' knowledge and conceptual structures of *come*. They were asked to judge the similarities between the sentences with different usages of *come*, and the results were analyzed by Multidimensional scaling (MDS) and. In Experiment 2, the participants were given the image schemas to stimulate their inference, then they were asked to do the same task in Experiment 2. The results were by MDS. The inter-point distance between the different usages were calculated based on the results of MDS in Experiment 1 and 2, and each points were connected by lines based on the rules in order to observe the developmental process of the networks. The results showed that image schemas stimulated inference and influenced the mental representations in mental lexicon. This suggested a part of mechanisms in developmental process in L2 mental lexicon and also would offer a suggestion of instruction of vocabulary teaching.

Keywords

L2 mental lexicon, vocabulary acquisition, L2 vocabulary development, graph theory, recategorization, image schema

Introduction

Considering L2 vocabulary acquisition, we have to consider many aspects. Some studies in psycholinguistics suggest that L2 learners should integrate the conceptual differences between two languages in the process of acquiring the other vocabulary. (De Groot, 1995; Kroll & Stewart, 1994; Dong, Gui & MacWhinney, 2005).

Ueda (2008, 2010) examined how structure of mental lexicon change as L2 learners are studying L2. Ueda (2001) also studied how image schema in cognitive linguistics can help learners understand L2 words. In this study, we re-examine the data in Ueda (2001) from the viewpoint of conceptual changes in the mental lexicon.

1 Models of the mental lexicon

Some models of bilingual mental lexicon are proposed in psychological linguistics. They are roughly divided into two types in the way of treatment of concept: Some models (like in Lambert, Ignatow & Krauthamer, 1968) hypothesize two separate language specific representational systems. Others propose (de Groot, 1995; Kroll and Stewart, 1994) shared representational systems. The four major models for the mental lexicon are 'concept mediation model' (Poter, So, von Eckardt and Feldman, 1984), 'distributed model' (De Grood ,1995), 'word association model' *(*de Groot, 1995), and 'shared asymmetrical model' (Dong, Gui and Macwhinney, 2005).

Considering the L2 vocabulary acquisition process, the most applicable model of the four is the shared asymmetrical model. This model was

proposed by Dong, Gui and Macwhinney (2005). In this model, L1 and L2 words do not only have separated conceptual representations, but share some of them. L2 learners have tendency to retain their L1 conceptual system and to add L2 conceptual system for L2 words. This model also emphasizes "the asymmetrical nature of L1 and L2 access to meanings and the extent to which meanings are both shared and partially separate for L1 and L2." (Dong et al, 2005).

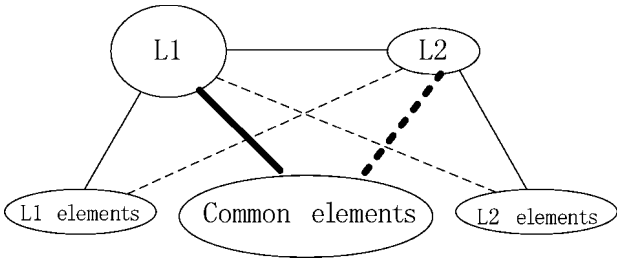

Figure 4. The shared asymmetrical model of Dong, Y., et al. (2005).

In this paper, based on this model, we can hypothesize that L2 learners should re-categorize the concepts in L1 as L2 concepts in some process of L2 vocabulary acquisition or that L2 learners should integrate the conceptual differences between two languages in the process of acquiring the other vocabulary. In this study, we observe how this vocabulary acquisition process would happen in L2 mental lexicon: that is, how conceptual changes in existing L1 concepts would happen to create new access between L2 words and L1 concepts.

2 Concepts and mental representations of L1 and L2 words

2.1.1 Concepts and semantic networks in cognitive linguistics

Cognitive linguistics supposes that the meanings in polysemous words show a radial expansion from the prototype to peripheral meanings, based on the studies on concepts in psycholinguistics (for example, Rosch & Mervis, 1975; Rosch, Mervis, Grey, Johnson, & Boyes-Braem, 1976). And the relations among meanings in a polysemous word are motivated by image schemas (Lakoff, 1987). Brugman (1988) studied English preposition, 'over' by using semantic networks, which explained the relationships among each meaning.

2.1.2 Conceptual Change in acquisition process

Some psycholinguists propose that when bilinguals acquire L2 words, which have concepts roughly equivalent to L1 but have different conceptual boundaries, or where one conceptual domain of L1 words is divided into two or more in L2, bilinguals have to restructure the L1 concepts to L2, or adjust the concepts of L2 to L1. (Ameel, Malt, Storms & Assche, 2009; Ijaz, 1986; Ueda, 2010). Rice (1999) also examined the patterns of Acquisition of the prepositions, *to* and *for*, by L1 speakers. In her study, to some extent, patterns of conceptual development was found: for example, spatial meaning emerges before temporal one, and specific meaning, before generic one.

2.2 Networks in the mental lexicon and graph theory

Some researchers in applied linguistics use graph theory to illustrate the structure of the mental lexicon. Especially, networks of word associations in the mental lexicon have been researched by many researchers (Kiss, 1968; Wilks & Meara, 2002; Wilks & Meara, 2007). The findings in these researches suggest graph theory can apply to studies on structures within words, or the mental lexicon.

In this research, graph theory is used to explain how the network structure within a polysemous English verb, *come*, can change by giving image schema to stimulate understanding of its various meanings.

2.3 Image schema of come

Image schemas are proposed in cognitive linguistics. According to Lakoff (1987), and Johnson (1987), image schemas are defined as follows:

Image schemas:

(1) Are not specific images but are abstract in another sense of that word.

(2) Represent schematic patters arising from imagistic domains that recur in a variety of embodied domains and structure our bodily experience.

Various image schemas are proposed by cognitive linguists. Clausner & Croft(1999) sum them up in the list. (Table 1).

Table 1: Various image schemas from Clausner & Croft (1999)

SPACE	UP-DOWN, FRONT-BACK, LEFT-RIGHT, NEAR-FAR, CENTER-PERIPHERY, CONTACT
SCALE	PATHE
CONTAINER	CONTAINMENT, IN-OUT, SURFACE, FULL-EMPTY, CONTENT
FORCE	BLANCE, COUNTERFORCE, COMPULSION, RESTRAINT, ENABLEMENT, BLOCKAGE, DIVERSION, ATTRACTION
UNITY/MULTIPLICITY	MERGING, COLLECTION, SPLITTING, ITERATION,

	PART-WHOLE, MASS-COUNT, LINK
IDENTITY	MATCHING, SUPERIMPOSITION
EXISTENCE	REMOVAL, BOUNDED SPACE, CYCLE, OBJECT, PROCESS

The image schema of *come* can be explained by image schema of CONTAINER. By using image schema, the verb, *come*, can be explained like this: Someone/something moves from some domain into other, where the focus is on the motion that the trajector come into the landmark domain. (For illustration for image schema of *come*, see *Figure 1*.)

3 Experiment

The experiment aimed to examine how the mental representations of basic English verb, *come*, in the mental lexicon of the second language learners of English change by stimulating inference. We conducted pre- and post-test in one week interval.

3.1 Method

3.1.1 Participants

The participants were forty six freshmen in Japanese university, who have studied English more than 6 years.

3.1.2 Materials

Ten sentences with different meanings of *come* were used. (Table2) These sentences were selected from example sentences in three dictionaries: *Collins Cobuild English Dictionary*, *Longman Dictionary of Contemporary English (third edition)*, and *Oxford Advanced Learner's Dictionary (Fifth edition)*. Sentence 10 contains the prototypical meaning of *come* and others have its peripheral meanings.

Table 2: Sentences used in Pre- and Post-Experiment.

1. Houses like that don't come cheap.
2. Cats come in many shapes and sizes.
3. The summer came to an end.
4. My family always comes first.
5. I've come for my book.
6. Help has come at last.
7. When is Anton coming for you?
8. How do you come to be so late?
9. The new law will come into effect next month.
10. Nearly half the students come from abroad.

3.1.3 Procedure

We conducted two experiments: Pre-test and Post-test. In Pre-test, the participants were asked to judge the similarities between meanings of come in the sentences in Table 1 by 7-point scaling in the pair-wised way. After one week, the participants were given the explanation of image schema of *come* with the image schema (*Figure 1*) as a hint when they thought of the relations among the various meanings of the *come*. The explanation used in the instruction is: "Someone/something moves from some domain into other, where the focus is on the motion that trajector come into landmark. Then, they were asked to do the same task as in Pre-test. The results in Pre-test and Post-test were analyzed by the multidimensional scaling (MDS). Based on the results of MDS, inter-point distances among the sentences were calculated, and compared.

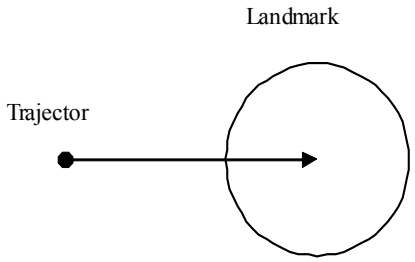

Figure 1: image schema of *come*

The results of the calculation of inter-point distances were analyzed by the graph theory. (In this study, we used the program, Pajek.) By following the criteria proposed by Waern (1972), semantic networks of *come* from the results of the two experiments were made. The criteria are as follows:

1) Only the highest similarities are included in the graph.
2) The cut-off point is lowered in order to get new connections between new points. (Those connections will not be included that are already accounted for by paths.)
3) The cut-off point is then lowered successively until no more meaningful information is obtained about the structure.

3.2 Results

The results of MDS in Pre- and Post-Test were very different. (See *Figure 2,3,4 and 5*.) Each meaning of *come* was distributed widely away in *Figure 2*, whereas they of each sentence seemed to make up a group with Sentence 4, 6 7, 8 and 10.

The results of *Figure 4* and *5*, which show the configurations of 2-dimention of the results in Pre-

and Post-test, can be interpreted as follows: Dimension 1 and Dimension 2 in *Figure 4* shows [(+)human-(-)human], and [prototypical -peripheral]; Dimension 1 and Dimension 2 in *Figure 5*, [prototypical -peripheral] and [image schema effect]. Dimension 2 in Figure 5 shows that each meaning is placed according to the similarity to image schema. This suggests that giving the instruction of image schema can affect the participants' understanding of *come*, and help them to recategorize the concept and networks of the meanings in their mental lexicon.

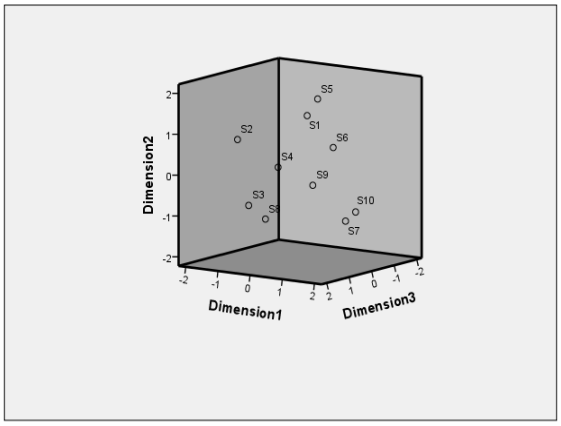

Figure 2: Configuration of '*come*' from the results of Pre-Test.
(Stress = . 21379, RSQ = .45123)

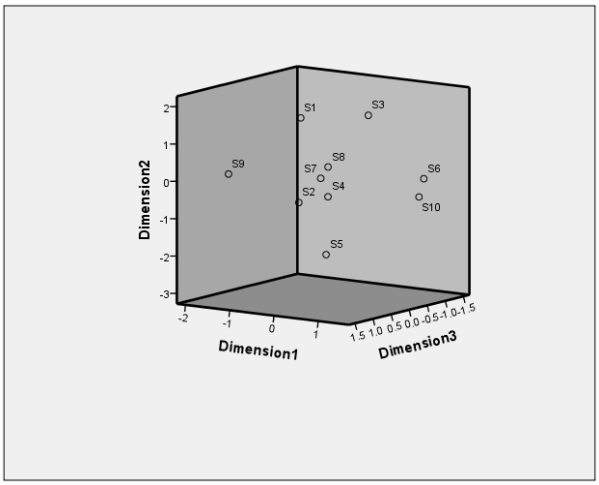

Figure 3: Configuration of '*come*' from the results of Post-Test.
(Stress = . 20555, RSQ = .56240)

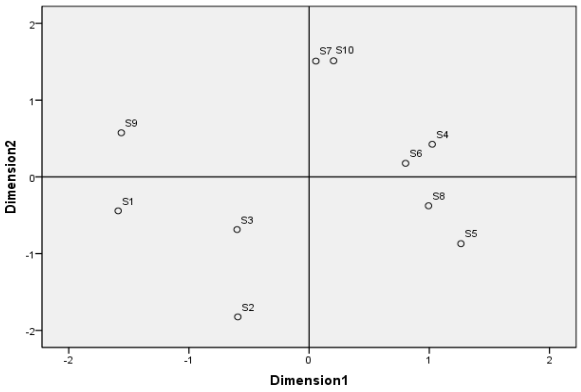

Figure 4: Configuration of 2-dimensional results of *come* in Pre-Test.
(Stress = . 29445, RSQ = .43471)

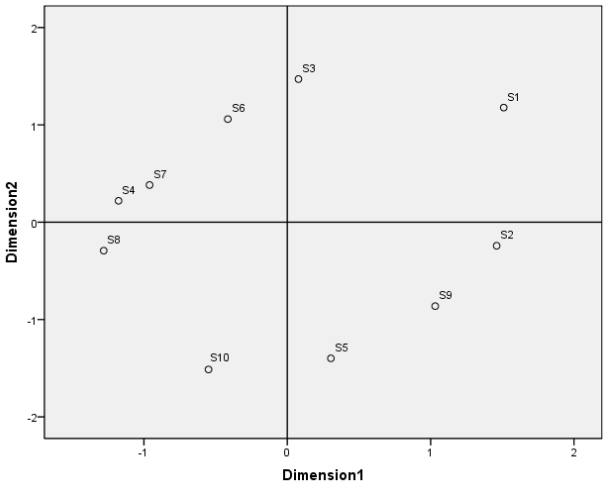

Figure 5: Configuration of 2-dimensional results of *come* in Post-Test.
(Stress = . 27800, RSQ = .52535)

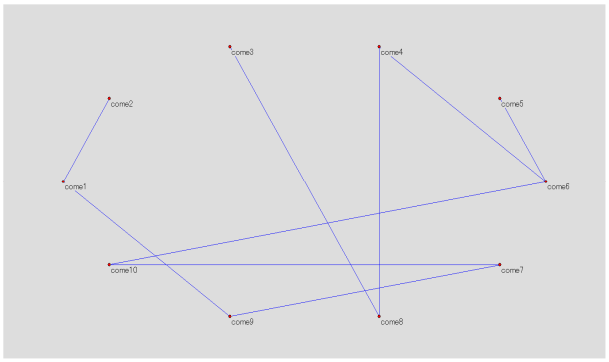

Figure6: Graph of the inter-point distances from the results of Pre-Test.

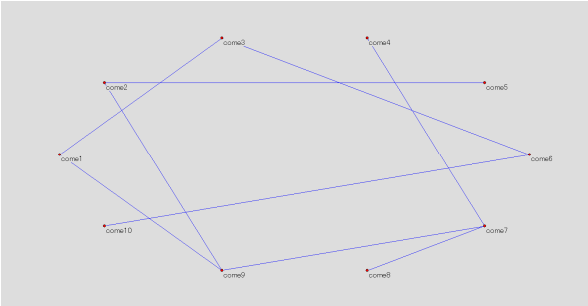

Figure 7: Graph of the inter-point distances from the results of Post-Test.

Figure 6 and *7*, showing the graphs of Pre-and Post-Test, give us more about the differences. The connections between Sentence 4 and 8, between Sentence 3 and , and between Sentence 4 and 6 were found in *Figure 4*, but they are disappeared in *Figure 5*. On the contrary, new connections were found between Sentence 1 and 3, between Sentence 2 and 9, between Sentence 3 and 6, between Sentence 4 and 7 and between Sentence 7 and 8. The results showed that the construction of the networks by graph theory was different between the results from Pre- and Post-test.

The graphs (*Figure 6 and 7*) also showed that the connections between meanings in the mental lexicon can change by instructing image schema. To make the connection development more clearly, other graphs are given in *Figure 8* and *9.* In these graph, lines (or edges) continued to be drawn until all the meanings (or all nodes) were connected by lines (or edges). It is easily understood which meanings make groups in these graphs. One group of meanings was formed by Sentence 3, 4 and 8 in Pre-test (Figure 6), whereas this meaning group disappeared in Post-test (Figure 7). However, new meaning groups was found in Post-test: One meaning group consist of Sentence 1,2 and 9; and the other, Sentence 4, 7 and 8.

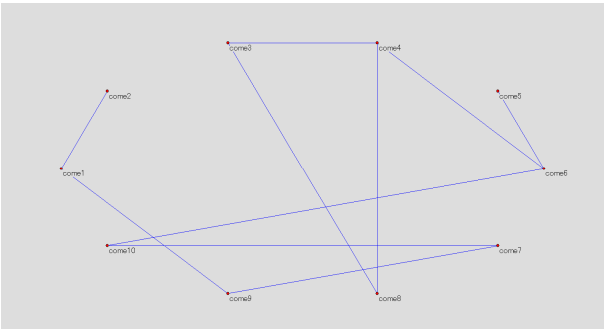

Figure6: Graph of the inter-point distances from the results of Pre-Test.

Note: lines (or edges) continued to be drawn until all the meanings (or all nodes) were connected by lines (or edges), based on the inter-point distances between each meanings from the results of MDS of Pre-test.

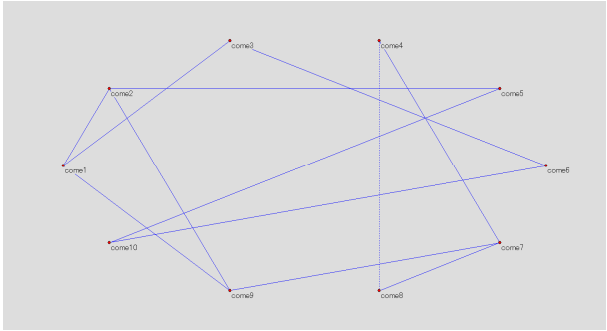

Figure7: Graph of the inter-point distances from the results of Pre-Test.

Note: lines (or edges) continued to be drawn until all the meanings (or all nodes) were connected by lines (or edges), based on the inter-point distances between each meanings from the results of MDS of Post-test.

4 Discussion

The purpose of this study was to examine how the mental representations of basic English verb, *come*, in the mental lexicon of the second language learners of English change by stimulating inference, or giving instruction of image schema. In the experiments, image schema was given to stimulate inference of meanings. The results of 2-dimensional solutions of MDS showed that the participants rearrange the meanings according to image schema.

This effect of image schema is found in creation and decomposition of degrees in the graphs in *Figure 4 and 5*. The semantic networks created by graph theory in the experiments support the idea that L2 learners should re-categorize the concepts in L1 as L2 concepts in some process of L2 vocabulary acquisition or that L2 learners should integrate the conceptual differences between two languages in the process of acquiring the other vocabulary, as in the studies of Ameel, Malt, Storms & Assche (2009) and Ijaz (1986).

The semantic networks obtained in the experiment also support the strength of the shared asymmetrical model (Dong, Gui and Macwhinney, 2005) in the point of L2 developmental process.

In this study, we examined the possibility that image schema can be a motivation for development of the mental lexicon. It is found that Image schema can affect L2 learners' understanding of meanings in a polysemous word. This suggests that image schema can be a motivation for development of understanding of word meanings in the mental lexicon. This also suggests that image schema can be useful and helpful in teaching L2 vocabulary in the L2 teaching settings.

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