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A Study on the Effect of Hierarchical Concept Mapping on Writing by Junior High School Students

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The present study focuses on hierarchical concept mapping as a means to improve English writing by Japanese junior high school students. First, the paper defines hierarchical concept mapping and represents its potential for Japanese junior high school students. Then, the paper reports the results of an experiment in which hierarchical concept mapping was introduced to an English writing class at a junior high school. The researchers examined the effectiveness of this instruction for 16 junior high school students, who were categorized as beginners in English proficiency, with questionnaires and writing tasks. The effectiveness of hierarchical concept mapping was assessed by (1) the changes in the organization of a paragraph and (2) the changes in the total number of produced words and sentences. The results indicated overall improvement in students' knowledge of a good paragraph as well as their skills. In summary, paragraph writing instruction incorporating hierarchical concept mapping showed positive effects on junior high school students' writing

Key Words：Hierarchical Concept Map, Paragraph Writing, Junior High School

1．Introduction

With the progress of globalization, we have now more opportunities to communicate with people all over the world, and English-language education in Japan has been receiving more attention than ever. The National Institute for Educational Policy Research (NIER) conducted a comprehensive survey of the academic ability of junior high school students in 2003 and high school students in 2005. In both surveys, writing problems, such as just juxtaposing sentences with little awareness of a related topic, improperly arranging ideas, and poorly structured paragraphs, were identified. Based on these results, NIER called for instruction that emphasized coherence of a paragraph and also cohesion in a paragraph. In other words, they pointed out that the connection between words and sentences should be made conscious to the learners. The latest *The Course of Study*, issued in 2008, required teachers to develop students' writing proficiency so that Japanese students could produce well-structured paragraphs.

English paragraphs inherently have two features: structure and textuality (Oi, et al. 2008). As far as structure is concerned, English paragraphs have three main elements: topic sentence, supporting sentences, and concluding sentence. As for the latter, writers should consider cohesion and coherence to achieve textuality. In view of these points, teachers have to teach explicitly how to write good English paragraphs to Japanese students, and the students will benefit from knowing this explicitly.

Usually, English writing takes the following cognitive processes: planning, translating, and reviewing (Flower & Hayes, 1980). Among these writing processes, not enough attention has been paid to the planning stage. Furthermore, there exists little research that focuses on planning for junior high school students' writing. However, planning plays an important role not only in language performance, but also in cognitive activities (Alamargot & Chanquoy, 2001). In the planning stage, mapping is usually a recommended approach to generate ideas for writing.

In this paper, we will focus on the planning stage in which two kinds of maps, an idea map and a hierarchical map, are incorporated, and show that an idea map alone is not sufficient; it should be supplemented with a hierarchical concept map in order to produce well-structured paragraphs. Further, we will show that, by using these maps, Japanese junior high school students will be able to write well-structured paragraphs.

2．Literature Review

2.1 The effect of planning

Although planning can be considered as a high level cognitive skill or as a mental activity (Akyürek, 1992), planning is of a great help for language production, since humans have limited cognitive capacity, and their abilities to direct their attention are also restricted during task performance (Robinson, 2003). Through planning, writers can enhance the quality of their language and consequently can produce successive and complex drafts (Alamargot & Chanquoy, 2001; Bereiter & Scardamalia, 1987; Ojima, 2006). In addition, planning is a way of reducing the cognitive

strain of writing (Ojima, 2006; Bereiter & Scardamalia, 1987; Flower & Hayes, 1980). Kellog (1994) stated that planning allows the writer the freedom to explore ideas in a tentative style, without the need to write a particular line of thought or expression. If cognitive strain is reduced, the writer can turn his/her attention more to other things, such as the reader and the structure of a paragraph; consequently, the quality of writing will improve (Iwao, 2001).

2. 2 The definition of mapping

Mapping is one of the most popular pre-tasks in writing, and it usually involves a strategic use of visual organizers. A visual organizer is a creative technique used to present information through graphic depictions of the relationships between concepts (Kang, 2004). According to Shapiro, Broek, and Flether (1995), mapping can help the writer to understand complicated ideas and information easily; as a result, it will reduce problem-solution strain in the writer's mind.

2. 2. 1 Idea map

An idea map was first proposed by Tony Buzan in the late 1960s, and Buzan (2006) defines it as "the way to make the best use of the skill in cerebral cortex, such as languages, images, numbers, logic, rhythm, colors, and spatial recognition, with the use of the only one effective technique." (p. 26). Figure 2. 1 is an example of an idea map. The writer first writes the topic in the center; then, the writer's various ideas are extended like branches. Every time many ideas, images, or any words related to the topic occur to the writer's mind, the writer draws a line and a circle and adds his ideas.

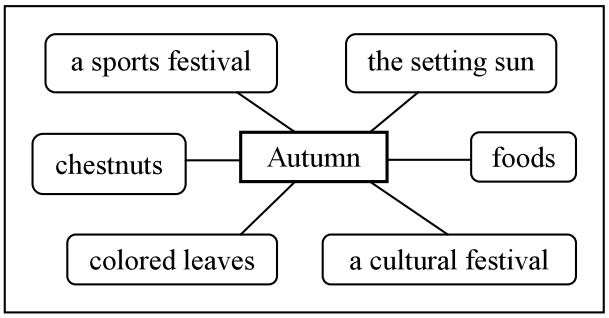

Figure 2. 1 An example of an idea map

Buzan (2006) noted that an idea map has some advantages in language learning, and they are mainly classified into three points: the writer can 1) enrich his imagination and generate a lot of ideas, 2) save time in gathering them, and 3) find improved the ability to memorize the items he/she has conceived. In addition, Ojima (2006) also stated that an idea map is useful to improve reading and writing skills. It is, however, doubtful that only idea-mapping instruction will help the learners to write a well-structured paragraph that fulfills the three criteria that Oi et al. (2008) set out: 1) paragraph structure, 2) textuality, and 3) hierarchy of ideas. Although using an idea map is effective in idea generation, it does not necessarily clarify the structure of an English paragraph. That is to say, after gaining enough ideas, the writer needs to organize these ideas to meet the hierarchical structure of an English paragraph (Iwao, 2001; Oi et al. 2008). To achieve this purpose, there comes a need for the distinction between superordinate concepts and subordinate concepts in English writing.

2. 2. 2 Hierarchical concept mapping

Iwao (2001) proposed hierarchical concept mapping at the planning stage, which classifies the writer's ideas and thoughts into superordinate concepts and subordinate concepts. According to Larkin and Simon (1987), maps that have hierarchy can have a greater tendency not only to categorize ideas, but also to express cause and effect relationships more easily than maps that do not.

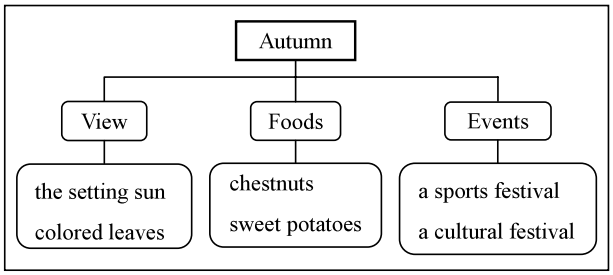

Figure 2. 2 An example of a hierarchical concept map

Figure 2. 2 presents an example of a hierarchical concept map. The writer first writes the topic at the top layer, and, in the second layer, writes main reasons that transform abstractions into language. Then, the writer adds supporting or concrete sentences in the third layer. When some ideas are represented as having some kind of relation (such as superordinate or subordinate), we can understand the concept more easily using graphically-represented figures than only written sentences (Shapiro, Broek, & Fletcher, 1995). Thus, we put our ideas into groups and show their relationships.

2. 2. 3 From an idea map to a hierarchical concept map

Although an idea map is effective in idea generation, it does not meet the requisites of the structure of an English paragraph, because it has only one dimension. A hierarchical concept map has structure, so it fits the requirement of an English paragraph, which has hierarchical structures. Therefore, we need to go through the transition from an idea map to a hierarchical concept map.

In this study, we will show that instruction on idea mapping alone is not sufficient. We have to have two

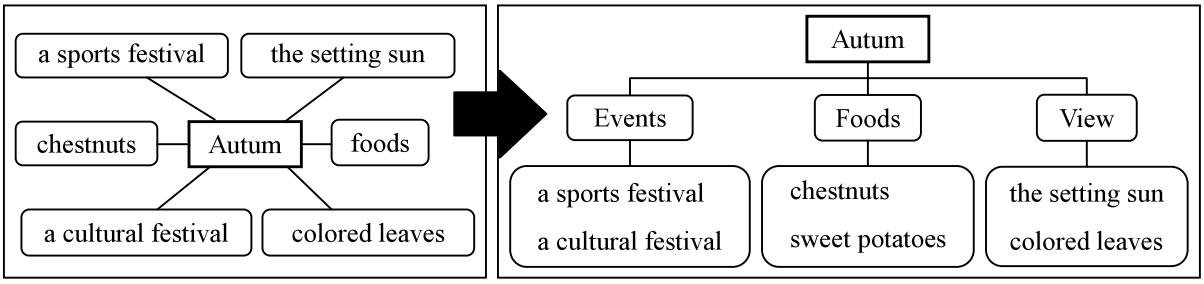

Figure 2. 3 From an idea map to a hierarchical concept map

kinds of maps in English writing: 1) an idea map in the process of idea generation; and 2) a hierarchical concept map in the processes of both idea generation and idea organization.

3. Study

3. 1 Purpose

The purpose of this study was to investigate how idea mapping and hierarchical concept mapping as pre-writing activities would influence students' writing. The effectiveness of using these maps was particularly going to be highlighted in this study. For this purpose, the following two research questions were addressed:

(1) Will junior high school students grasp the concept of well-structured paragraphs by using a hierarchical concept map incorporated into an idea map ?

(2) Will junior high school students improve their writing through getting explicit instruction on the characteristic features of English paragraphs ?

3. 2 Participants

The participants in this study were 16 third-year students at a junior high school attached to a national university.

3. 3 Procedure

This study consisted of (1) a pre-test, (2) a series of paragraph writing instructions, (3) instruction on an idea map, (4) instruction on a hierarchical concept map, and (5) a questionnaire. It lasted for approximately four months during the second semester of the 2008 academic year.

3. 3. 1 Experimental procedure

The details of each class instruction are illustrated in Figure 3. 1. The participants composed English paragraphs in every class and handed them in with the reflection sheets and the maps that they had drawn. The students' writings were returned with corrections and comments by the researchers in the next class.

3. 4 Analytical measures

The participants' progress was evaluated by the questionnaire and the paragraph writing evaluation sheet with the descriptors that matched the content of our instruction (Fig. 3. 2). The questionnaire, which included both multiple-choice questions and free-comment writing, was used to assess the students' un-

1st class (November 11th)	Pre-test, Questionnaire/Prompt: Write your opinion on the idea "Junior high school students should have their own room to study".
2nd class (December 2nd)	Paragraph writing instruction (characteristics of English essays)/Prompt: Introduce your favorite foods.
3rd class (December 8th)	Paragraph writing instruction (logical connectors)/Prompt: Introduce your school.
4th class (December 15th)	Idea map instruction (Idea generation)/Prompt: What is the best season for you among four seasons ?
5th class (January 20th)	Idea map instruction (Idea generation)/Prompt: Suppose that exchange students come to Japan. Where do you take them ?
6th class (February 2nd)	Hierarchical concept map instruction (Idea organization)/Prompt: Write your opinion on the idea "Junior high school students must not bring their mobile phone to school".
7th class (February 16th)	Hierarchical concept map instruction (Idea organization)/Prompt: Write your opinion on the idea "Junior high school students should do club activities".
8th class (February 24th)	Post-test, Questionnaire/Prompt: Write your opinion on the idea "Junior high school students should have their own room to study".

Figure 3. 1 Experimental procedure

derstanding on paragraph writing. The evaluation sheet consisted of seven items, with each descriptor having the value of one point; thus the total score was seven. In addition, the number of reasons and details and the total number of words and sentences in each composition were also calculated.

1	The writer's claim is written at the beginning of a sentence	
2	A reason/reasons are written	
3	These reasons support the writer's claim	
4	Details are written to support reasons	
5	A writer's conclusion is written	
6	The paragraph has a unity	
7	Logical connectors are used appropriately	
The total number of scores		

Figure 3.2　The evaluation sheet

The evaluation was conducted by the present researchers independently, and we added our scores and divided them by two; thus we obtained the average score for each category of the evaluation.

4．Results and Discussion

4.1　Summary of findings

4.1.1　Students' understanding of the two kinds of maps

The participants stated in the questionnaire that they became able to write well-structured sentences and convincing paragraphs through the series of instruction. In addition, they stated that they learned to organize their ideas properly, and the order of arranging them, and consequently they were able to write their ideas hierarchically after they learned an idea map as idea generation and a hierarchical concept map as idea organization. These statements indicate that the two kinds of mapping helped them improve their writing.

4.1.2　Results of text analysis

Table 4.1 shows descriptive statistics of the average number of scores as measured in our evaluation sheet. The average score of the students' composition was 3.4 for the pre-test and 5.8 for the post-test. Considering that the full score is seven, they arrived at writing better-structured English paragraphs, while being aware of the characteristic features of English writing. We ran a dependent t-test, and there was a significant increase between the pre- and post-tests.

Table 4.1　Changes in the number of scores

	Average number of scores	Standard deviation
Pre-test	3.4	2.217
Post-test	5.8*	1.759
	$t(15) = -4.027$	$p^* < .05$

Table 4.2 shows descriptive statistics of the average number of words and sentences produced in the student writing. The participants wrote 59.4 words and 5.73 sentences on average in the pre-test and 70.2 words and 7.2 sentences in the post-test. We ran a dependent t-test for both data to examine the changes. As far as the number of words was concerned, the difference was slightly over the significant level ($p = .055$); however, for the number of sentences, there was a significant increase as shown in Tables 4.2.

Thus we can conclude that the texts the students produced in the post-test were better in both quality and quality; they improved their writing skills.

4.1.3　A case study

Because of a limitation in space, we will present here the case of one student. One participant's progress in this experiment is provided in Table 4.4. This student produced 53 words and seven sentences, scored two in the evaluation, and produced no reason and detail for the pre-test. In the sixth class, in which hierarchical concept map instruction was introduced for the first time, she produced 35 words and 5 sentences, scored five, and produced two reasons and one detail. Finally, in the post-test she produced 82 words ten sentences, scored seven, and produced two reasons and two details to support her claim.

Below is her composition for the pre-test. As can be seen in Table 4.4, this composition does not meet the characteristic features of English writing. In addition, this was not convincing enough with no appropriate reasons and details.

Pre-test : *I think students do not need their room. Studying in the my room is very good. It's important for me to studying in the quiet room. If I have no room, I will study in the living room. There will be my mother and my brother and my father. Living room isn't quiet. So I don'tstudy hard.*

Table 4.2　Changes in the number of words and sentences

	Average number of words	SD	Average number of sentences	SD
Pre-test	59.4	33.815	5.81	2.926
Post-test	70.2	31.081	7.38＊	2.680
	$t(15) = -2.082$	n.s.	$t(15) = -2.374$	p＊$< .05$

Table 4. 4 One participant's progress

	Words	Sentences	Evaluation	Reasons	Details
Pre-test	53	7	2	0	0
6th class	35	5	5	2	1
Post-test	82	10	7	2	2

Below is her composition for the sixth class. Although the number of words decreased, she produced two reasons to fortify her claim. This suggests that she successfully classified her ideas into categories based on the related topic.

The sixth class : *I disagree with this plan. When we involved in accident, we can call our families. So we are safety. It is useful to use a mobile phone. Because we send e-mail to make friends.*

Below is her composition for the post-test. She produced not only more words, but also two reasons and details to support her claim. As her ideas are categorized hierarchically, her paragraph is well-structured and convincing.

Post-test : *I think that we need our room when we study English very hard. First of all, there are not people. If I don't have my room, there are my parents or brother or sister in my room. I may be spoken them then. Secondly, in the room is quietly. There is a TV in my living room. There is a music, too. It is noisy that I can't study English very hard. That's too bad. So I agree with it.*

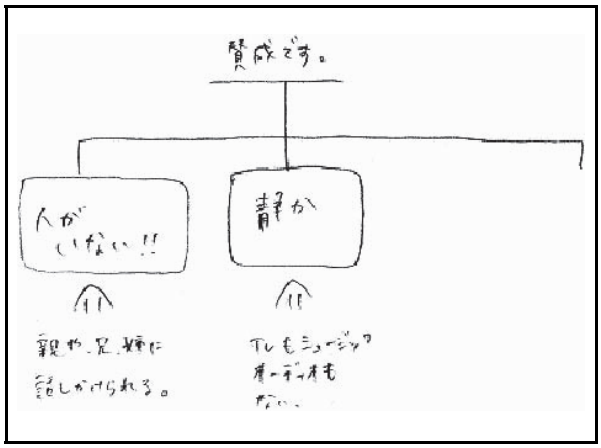

Figure 4. 1 The hierarchical concept map

Figure 4. 1 shows the hierarchical concept map that she drew in the planning stage in the post test. As can be seen in this map, she classified her ideas into superordinate concepts and subordinate concepts, and consequently, her composition shows a hierarchically-structured paragraph. In her writing, she increased reasons and details. This suggests that she wrote a paragraph being aware of the characteristic features of English writing, as shown in Table 4. 4. In the questionnaire survey, she stated that she was able to categorize her ideas by using a map, and understand how to write a paragraph because the instructors showed examples of well-structured paragraphs and the characteristic features of English essays in every class. This indicates the importance of explicit instruction on paragraph writing.

5. Conclusion

The present study examined the effectiveness of hierarchical concept mapping incorporated into idea mapping in paragraph writing for junior high school students. Conclusions are summarized in the following two points. First, according to the questionnaire survey administered at the post-test, junior high school students became able to categorize their ideas hierarchically by using idea maps and hierarchical concept maps, and consequently, their writing manifested hierarchically-structured paragraphs with superordinate concepts and subordinate concepts arranged properly. Second, junior high school students produced better-structured paragraphs that showed the characteristic features of English writing; that is, their writing improved in terms of paragraph structure, textuality, and hierarchy of ideas.

This study has two limitations: 1) the length of the experiment was not long enough to fully determine the effectiveness of idea map and hierarchical concept map instruction, and 2) the number of the participants was rather too small to capture the effects of the instruction using these maps at the statistical level. In the spite of these limitations; however, this study has contributed to the importance of exhibiting the writers' ideas hierarchically as a pre-writing activity in order to write better English paragraphs. Further research is needed to investigate the effects of using hierarchical concept maps in English writing with varied levels of participants.

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