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Text Organization through Concept Mapping: A Different Aspect on Reading Comprehension

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Abstract: Reading is an important learning skill. But in Taiwan, the traditional education lead student to study passively when reading. Recently, the organization of text structure is thought to be an effective way on reading. On organizing, learners can comprehend and memorize their ideas by building their own text structure. Concept mapping is an organizing method which is widely used in education. This study designed an E-Book system with concept mapping function. We defined three concept mapping activities with different concept maps supported, Full Map, Partial Map and No Map. This study is to investigate the user behavior of reading through different supported map and see which is better helped on reading.

Keywords: e-book, concept mapping, text structure, text organization, scaffolding

1. Introduction

Reading skills take a big part of our learning. In Taiwan, the education mode leads the students to accept the knowledge passively from the textbooks. Therefore, the students in Taiwan are always lack of active thinking. The teaching materials and textbooks are the primary resources during our learning processes in Taiwan. These kinds of reading materials give readers information to learn. The readers have to try to understand what the authors want to tell you and organize the information into their own memories. This process was called "ENCODING" (Craik, 1983). The ENCODING ability is based on your faculty of memory (Cowan, 2000; Miller, 1956). The use of good organization strategies in reading help the readers constructing their own memories and also make the ENCODING process easier (Dwyer, Hogan and Stewart, 2010). As mentioned above, people can learn better by organizing information themselves than reading the textbooks which are organized by others (Kintsch, 1994). Therefore, it is very important to find the text structure in reading comprehension.

The readers can easily notice the logical structure of the articles and the relations with other parts though the text structure. And it truly makes a great benefit to the readers on their learning. For instance, it helps the readers to distinguish the different ideas between the authors and the reader's about the gist of the article (Meyer, Brandt and Bluth, 1980). By using the text structure, we can make reading much more efficient. Now, the text structure has been a key factor in our learning and memorizing (Bower, Clark, Lesgold and Winzenz, 1969). The previous studies prove that the well-constructed text is much easier to understand and to remember. Consequently, there are a lot of organization strategies designed for people to translate the information from text to their own memories, such as annotations, concept mapping (Novak & Gowin, 1984; Novak & Musonda, 1991), and hierarchical summarizations (Taylor, 1982).

Concept mapping, it's an organization strategy which helps the learners to understand the relationship between concepts. During the process of clarifying concepts and building maps, the learners can also understand the real meaning of the concepts (Novak & Gowin, 1984; Novak & Musonda, 1991). The learners organize those fragmental and abstract concepts into a complete one. They use appropriate connections to connect each concept and make those concepts become a related network which is called concept map. Concept mapping is to known as a helpful way in learning, and the following are the reasons for that. First, people are used to understand and remember the knowledge after they organize and integrate it (Brainerd & Gordon, 1994). Second, concept map

represents a simple but lucid structure which is benefit to learning (Hall, Dansereau and Skaggs, 1992; Nesbit & Adesope, 2006; Rewey, Dansereau & Peel, 1991). Third, it is easy for people to memorize and recall the ideas which are correlative (Joseph & Alberto, 2008). And the fourth, concept mapping is considered to be a meaningful way in learning (Safayeni & Derbentseva, 2005; Heinz-Fry & Novak, 1990; Novak, 1998). Generally speaking, the learners have to organize the concepts in the beginning, and then make some links to clarify the correlations between those related nodes in their mapping. Learners also re-combine the concept map in order to make the map clearer and more structural (Robinson & Schraw, 1994).

In the previous studies, they had compared the learning effort under concept mapping in many different ways (Chang, Sung & Chen, 2001). Two kinds of methods are mentioned in this study: Construct-On-Self and Construct-On-Scaffold. They are provided to help students to construct their own concept map when learning. In the team of Construct-on-Scaffold, they offer students the concept map framework belongs to the expert's. The students have to complete their concept maps according to the expert's. After the experiment, they found that Construct-On-Scaffold is better than Construct-On-Self on learning efficiency.

Chang and other researchers did a similar study before (Chang, Sung & Chen, 2002). They divided students into three parts: Map-Correction group, Scaffold-Fading group and Map-Generation group. The Map-Correction group has the reference concept map which reached at about 40% completeness. When learning, the students filled the uncompleted part and accomplished the map. The Scaffold-Fading group, a complete expert map was given at the first. But the completeness of map would decrease gradually. At last, the students were asked to finish their own map without any reference maps. The Map-Generation group was asked to complete concept map without any assistance from start to the end. In terms of the result, the group of Map-Correction worked better on reading comprehension and summarization. And the Scaffold-Fading also made some improvement on summarization.

According the above studies, we can easily know that concept mapping is beneficial on learning. Besides, many teaching strategies now are also based on concept mapping. However, the most studies were focus on learning performance with concept mapping. Therefore, our study makes a new issue about concept mapping. We want to investigate the user behavior when the students make the process of concept mapping under different approaches. We defined three different concept mapping activities called Full-Map, Partial-Map and No-Map. This study, not only compares the performance with different concept mapping approaches, but also cares about the behavior of readers while reading under those map provided.

In conclusion, reading takes a big part of learning process. However, our traditional education mode makes the students learn passively. In order to understand and fix this problem, we made this study. In our study, we provided three kinds of maps for students to refer to. We asked students to organize text structure by using those reference concept maps. At the same time, we observed students' behavior and try to make some conclusion.

2. System Description

We designed an E-Book system where users can construct their own concept maps while reading. The allocation of this system can be divided into two parts: a concept mapping block on the left and a main reading block on the right. The reading block is designed for readers to make some operations while reading on the text. They can change the text page by clicking the button next to the reading area. We also add the annotating function in this system. If they need to highlight some words or sentences, they choose the area they want and then click the right mouse button, choose the option "HIGHLIGHT". The selected area will be painted yellow on its background color. And readers can also make notes by clicking the right mouse button and choose the option "NOTE". On clicking the button "NOTE", a pop-up window showed. People can edit it as a note. After finishing the note, it becomes a mark on this page. If you want to check the content of this note, double click on it. All of the activities like highlight or note will automatically add to the concept mapping block on the left.

The concept mapping block on the left is designed for user to construct their concept maps. In this study, we used the hierarchical structure to present concept maps. There are some advances for using that. First, organizing or operating the hierarchical concept maps is much easier than the general

ones. Second, using the hierarchical concept map can clearly express the users' thinking. The map consists of Directory Node, Highlight Node, and Note Node. All of them have their own icons.

The Directory Node is shown as a picture like a directory, the Highlight Node is shown as an underline mark, and the Note Node is shown as an envelope mark.

Directory Node is used to classify the annotations of different topics. The readers can add Directory Nodes based on their requirements. Readers can add any other nodes into a Directory Node or move a nested Directory Node into the other one. So that, the structures of the concept map edited by readers are much more conscientious and careful. As mentioned before, on highlighting some areas on the text, this system will create a note called Highlight Node at the concept mapping block. Readers can double click on that node to check the content. When clicking on the node, the block of reading page would flip to the specific page where the Highlight Node was created. Readers can edit the title about the Highlight Node which can help reader to manage it efficiently. The use of Note Node is similar to Highlight Node. Readers can click on the node to check the content about the Note Node. Also, it is allowed to modify the title and content of Note Nodes. Every kind of node in the concept maps will be allocated at the default position. If need be, readers can drag the mouse and move nodes to the specific positions. By the way, only Directory Node can be the parent nodes which can be added by the other nodes. To summary, readers can handle this system just rely on using mouse and keyboard.

3. Method

3.1 Design

We designed an experiment to observe the user behavior under different concept mapping activities. After analyzing the result, we can know what concept mapping style is better on reading. We defined three activities, "Full-Map", "Partial- Map", and "No-Map". In the activity of "Full-Map", we provide a complete expert concept map as assistance for readers. In the activity of "Partial-Map", we only provide a partial expert concept map which contains only the Directory Nodes. And the activity of "No-Map", we provided nothing. Readers have to read without any support. In this experiment, we provided an E-Book system which user can construct their own hierarchical concept map and make some annotations on reading texts. After using our E-Book system with different concept map activities, we ask users to attend the one-by-one interview and fill out some questionnaire.

There are twenty-one undergraduates from National Central University in Taiwan took part of this experiment. All the students read the same sixty-page text which is talk about computer science by using the E-Book system. Students were divided into three parts called "Full-Map" group, "Partial-Map" group, and "No-Map" group randomly. There were seven students in "Full-Map" group, seven in "Partial-Map" group, and seven in "No-Map" group. In group "Full-Map", they were provided the complete expert concept map as assistance. In group "Partial-Map" group, they were provided a partial expert concept map. And the group "No-Map" group, they had nothing to refer.

After the experiment, we asked students to fill out some questionnaires and take part of the one-by-one interview. We designed the questionnaire with five-point Likert Scale. The content of questionnaire consisted of three parts, common, individual and short answer part. The common part is designed to investigate the cognition of students' about concept map, and the comprehension of organizing text structure. The three activities groups used the same common part questionnaire. And the individual part and short answer part are designed dividedly for the three different groups, Full Map, Partial Map and No Map group. Both of the two parts are set to investigate the user behavior and the effort of expert concept map under the different actives groups.

3.2 Procedure

This experiment is divided into three phases. The first phase is called Instructing. We instructed students the importance of organizing text structure and tried to explain the principles of concept map clearly. At the same time, we taught them how to use this E-Book system. Then, we gave them about ten minutes to practice. The first phase took about twenty minutes. After the first phase, students were

asked to attend to the second phase called Experiment. In second phase, students were asked to read the teaching materials with the E-Book system at about two weeks. In order to observe the user behavior on the different activities groups, we provided three different concept maps as assistance in the E-Book system individually. After two weeks, we started to execute the third phase called Questionnaire and Interview. Every student had to fill out some questionnaires cost about fifteen minutes. At the end of experiment, we chose two students from the three activities groups respectively and made the one-by-on interview with them.

4. Result

According to the result of short answer question, there are 80% students agree with the support of reference concept maps in Full-Map group. And 50% students in Full-map group expect to get the complete one. Only 30% students want to get the partial expert map. Besides, there are nearly 80% students in Full-Map group think the concept map is useful in reading. The 50% students in Partial-Map group think the support of expert concept map is needed and most of them want to get the complete expert map than partial one. In No-Map group, the 71% students expect to have the reference concept map supported. And all the students in No-Map group want to have the complete expert map as assistance. In addition, the 57% students in No-Map group are agreed with that concept mapping is useful for students to organize their ideas.

The interviews were focus on the user behavior of doing concept mapping with the E-Book system. We want to observe the different effort on students under the three different concept map actives. Base on the result of interviews, students were not used to do concept mapping. In Full Map group, students used the expert map as assistance, but they also made some extra annotations by themselves. In Partial Map group, students spent less time to understand the gist of article by using the partial concept map. And students in No-Map group all expect to have reference concept maps to assist their reading.

5. Discussion

5.1 Reading Support

In this study, we provided an E-Book system with concept mapping function to assist students in their reading activities. Nevertheless, we found that students were not used to organize their ideas or thinking by doing concept mapping. However, they were willing to use expert concept maps as assistance. They can easily preview and review by using expert concept map which were already organized by experts.

According to the questionnaire, students in Full-Map group were generally agreed that the reference expert maps are appropriate for them. Even though they referred to the expert maps, they still read the whole reading material. Based on that, we presumed the most students would like to organize their own ideas after reading the whole material. And they trust that can make a deeper impression on their learning.

The result based on the questionnaire also showed that students in Partial Map group can be inspired to find all the relation paragraphs according to partial expert maps. The expert partial map provided a clear view of text structure which helped students to organize their ideas more easily. According to the result of short answer questions, we found that most students expect to have the complete expert map to refer than partial one. Students in Taiwan spend a little time on their reading, so they are not willing to spend a lot of time to do concept mapping. From the result of interviews, we also knew students will be willing to use partial expert maps to help their organization if time is enough to. But if it is imperative, the complete expert map is much more appropriate for them. As above, we suggest that the partial map is more suitable for the long-term reading activities.

Based on the result of questionnaire about the individual part, we found students in No Map group think that doing concept mapping is good for them to understand how to organize their own ideas or thinking. But they expect to have a complete teaching process about how to do concept

mapping or be provided an expert concept map to assist. It seems that students in Taiwan are lack of doing concept mapping. Thus, students in Taiwan should take much time on practicing doing that.

5.2 User behavior

On reading, students can use concept maps as assistance. Therefore, students can save a lot of time on organizing their ideas. It is worth noticing that the numbers of flipping pages by clicking the nodes on concept maps in Full Map group is more than Partial Map group and No Map group. It means that students who are provided a complete expert map would refer to the map on their learning.

From the annotation point of view, we found students in Partial Map group made more notes than the other two groups. It represents that the partial map can inspire the students to be willing to make it complete. Thus, they would try hard to find the related paragraphs or sentences and make more notes on the text materials. To summary, students can use the partial concept map to help them to construct text structure and organize their ideas.

Also, we found students in No Map group built few directories when doing concept mapping. This observation showed that students in Taiwan are not use to organizing their ideas when reading. Thus, it is hard for students to doing concept mapping.

6. Conclusion

In this study, we try to figure out the effect under different concept maps supported on reading. Thus, we provided three kinds of concept map activities which use the different reference maps, Full Map, Partial Map and No Map as assistance in students' reading activities. From the point of reading supported, Full Map made the best performance on learning. Students used Full Map spent less time to understand the gist of an article or a reading material. Also, they have the better understanding on it. However, the students also get help from the using of expert Partial Map. Those students were willing to finish the Partial Map to a complete one. Furthermore, students can organize their own ideas via referring to expert Partial Map. In this experiment, time is the most important variable. Under the condition of having enough time, students are willing to use Partial Map as a reading assistance. Although, the help of referring Full Map and Partial Map are both good for students, we still expect that our education mode can lead student to organize ideas by their own. Thus, they definitely can promote their reading ability. But now, the most important of all is that we have to make students get used to operate on an E-Book system.

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