Comparing between SB-mapping method and KB-mapping method in avoiding Sentence by Sentence Comprehension Style in EFL Reading

Mohammad ALKHATEEB1,2, Yusuke HAYASHI1, Taha RAJAB3 and Tsukasa HIRASHIMA1

1 Graduate school of engineering, Hiroshima University, JAPAN
2 Faculty of mechanical and electrical engineering, Tishreen University, SYRIA
3 Institute for Effective Education, University of York, UK

Abstract: Previous researches on supporting EFL (English as a Foreign Language) reading showed that Kit Build concept mapping (KB-mapping) method has better efficiency than Scratch Build concept mapping (SB-mapping) method in recalling the comprehended information two weeks later. In this research, we set out to investigate the following research question “Why KB-mapping method has better efficiency than SB-mapping method in recalling the comprehended information two weeks later?”. One of the common comprehension styles in the EFL reading comprehension tasks is the sentence-by-sentence, where learners understand the text by closely following each sentence in the text. Learners will be able to sentence-by-sentence answer the Comprehension Test (CT) just after the reading, but many investigations indicated that, this understanding could not be kept for a longer time as is the case in the Delayed CT (DCT). We have an assumption that KB-mapping method promotes a learner to read not sentence-by-sentence, although SB-mapping method does not promote same as KB-mapping method. In order to confirm this assumption, we conducted an experiment to compare the learner’s comprehension with KB-mapping and SB-mapping methods. The outcome of the experiment confirms our previous results regarding the efficiency of KB-mapping. Moreover, the analysis of the progress of map building gives a proof that although KB-mapping method helps the learners to avoid the sentence-by-sentence comprehension style the SB-mapping method could not help the learners to escape from this style of comprehension.

1. Introduction

In language learning contexts, reading comprehension is an important learning activity that requires a special ability from the learner to reap its benefits. Reading comprehension poses many challenges as learners may experience one of these challenges: slow reading, insufficient vocabulary comprehension and poor recalling (Pearson & Johnson, 1978). Researchers have always tried to support this learning activity by proposing various methods and strategies. The main goal is to boost comprehension skills in the target subject area. When these methods or strategies are deployed in a language course, the main objective is to improve student reading comprehension of the text in addition to contributing to the acquisition of the Target Language (Graves & Graves, 1998; Kalhor & Shakibaei, 2012).

Reading comprehension in EFL context is a special case because it is a complex, dynamic, multi-componential and multi-dimensional task in the learning process (Phakiti, 2006). It is a continuous process of multiple interactions between the readers’ background knowledge in their Mother Language (ML) and the knowledge exposed to in the Target Language (here English) (Coady & Huckin, 1997). Broadly speaking, the reading comprehension of EFL is the same as the ML reading comprehension but is slower and less successful than ML reading. This can be explained by the fact that the reading process is dependent on many factors such as the level of the readers’ language proficiency, the subject matter of the text, text difficulty and task demands (Anderson & Cheng, 1999).

In our previous research (Alkhateeb & Hirashima 2015), we found that the KB-mapping method (Hirashima 2015) has the same efficiency of SB-mapping method for the comprehended information in the Comprehension Test (CT) just after the use of the method. On the other hand, KB-mapping has a better efficiency for recalling the comprehended information in the Delayed Comprehension Test (DCT) two weeks later. The research question “Why KB-mapping is better than SB-mapping in recalling information two weeks later?” is the main question of this research. To answer this question, we have added a new function to KB-system in order to monitor the progress of map building for the KB-map building and the SB-map building. Then, we analyzed this data to investigate the cause of this phenomenon.
1.1 EFL Reading Comprehension

‘Comprehension’ as a concept is defined as “the ability to understand something” in the Oxford Dictionary. The definition in the Cambridge Dictionary is “the ability to understand completely and be familiar with a situation, facts, etc.”. For the purpose of this research, ‘reading comprehension’ will be defined as “a learner’s ability to understand completely and memorize the important information that is included in the text he/she is reading”. The definition necessarily includes the level of understanding a text/message. Such an understanding comes from the interaction between the written words and how the learners trigger knowledge outside the text/message.

One of the most common styles of comprehension in the EFL reading comprehension learning activity is the sentence-by-sentence style (Gernsbacher 1996). Most of learners in EFL reading comprehension are tied to sentence-by-sentence comprehension (Grabe & Stoller 1997), this comprehension style is effective for comprehending the EFL text from the short time point of view as in the CT, but it is not so effective for recalling the comprehended information after a while as in the DCT (Mckoon & Ratcliff, 1980; Block, 1986; Snowling & Frith, 1986). In our previous research, we found that the KB-mapping and SB-mapping methods have the same efficiency for comprehending the EFL text just after the method use, but KB-mapping method has a better efficiency for recalling the comprehended information later. So we are going to compare the KB-mapping and SB-mapping methods to support the learners of EFL reading comprehension task to avoid the sentence-by-sentence style of comprehension.

1.2 Scratch Build Concept Mapping Method

Scratch Build concept mapping Method, SB-mapping, is one of the newest strategies used to support the reading comprehension learning task, and it gives good effects on reading comprehension of EFL learners (Manoli & Papadopoulou 2012, Salehi & Khodabandehlou, 2013). SB-maps are visual representations of the knowledge which can be employed as a learning strategy by the learners to find the relationship between current knowledge and new information (Phantharakphong & Pothitha 2014). Researchers have confirmed that EFL learners who used concept mapping gained high understanding in reading comprehension. Also, many studies proved that the concept mapping or semantic mapping technique could improve the learners’ reading comprehension because they could understand the text more easily through the concept map.

SB-mapping provides learners with opportunities to become actively involved in their learning while linking knowledge to the long-term memory. Through the use of concept maps, learners have opportunities to organize their thoughts in a concrete and/or graphic/visual format, while connecting concepts and linking prior knowledge to new knowledge (Manoli & Papadopoulou 2012). Accordingly, related concepts become connected rather than being fragmented. Concept maps also provide learners with opportunities to reconsider their own thinking, as they reflect on their conceptual understandings. The process of map drawing has a positive impact on learners’ awareness of the reading process and learners can have more control over reading comprehension in English by visually representing what is conveyed in the texts they read.

1.3 Kit-Build Concept Mapping Method

KB-map is “a framework to realize automatic diagnosis of concept maps built by learners and to give feedback to their errors in the maps” (Sugihara & Hirashima 2012). KB-map is a special kind of concept map. The creation of concept map consists of two steps: the extraction of the concepts and the relations from the text and the selection of the responsible relation that connects two concepts together. In KB-mapping, the supervisor makes the first step by creating the goal map from text and after that he can generate the kit from the goal map by dividing the goal map to concepts and relations, providing learners with this kit. After that, learners are tasked to build the concept map (called learner’s map) by using the concepts and the relations that provided in the kit. While the SB-mapping and KB-mapping allow learners to organize ideas and determine the relations between them, KB-mapping does it with more controlling and redirecting of the learners; it helps evoking prior knowledge through KB-map creation. This method can be used in any discipline to help learners to make connections between ideas, but the provided kit (all the important concepts and relations) always controls the process.

Reading comprehension refers to the ability to understand information presented in a written form. KB-mapping method, as its applications, helps the learners to understand the information presented in a written form, by converting the written information into a graphical form. Such a graphical form is easily recognized and is easier to be scanned for a specific word or general idea. Moreover, it allows for a more holistic understanding of the text, but at the same
time controls the process of building the learners’ map by the provided kit.

2. The Relation between Map Building and Comprehension Style

Both SB-map and KB-map are useful tools to promote learners to describe their knowledge or understandings by themselves (Novak & Gowin, 1984; Yamasaki & Funaoi, 2010). From the viewpoint of teaching, the maps built by learners are promising products to examine the students’ understandings (Barenholz & Tamir, 1992; Ozgemir, 2005; Hirashima & Funaoi, 2015). These researches indicated that the resulted map from the building process is a useful tool to evaluate the learner’s understanding. In addition to that, we think that the building progress of a map is also a good indicator to show the learner’s way of understanding. Accordingly, we propose the monitoring of progress of map building as a new method to describe the kind of learner’s understanding, as the comprehension style in the EFL reading comprehension learning task in this research. In the next section, we are presenting the proposed method to monitor the map building progress during the building process, with an example applied in our experiment.

2.1 The Monitoring Method

Generally, the map consists of many propositions, which in turn consists of two nodes and a link. During the map building process, the learners are going to build the map by adding new propositions to the map. If we can check the way of map building, we can confirm the method or the style of learner’s reading. One of the most common styles in EFL reading comprehension is the sentence-by-sentence reading. In this style, the learner tries to understand the text as individual sentences. To check if the learners are following this style of reading, we proposed a method to compare the map building sequence with the text following sequence. In doing so, for the KB-group learners, we gave values for all the propositions of the goal map, according to their appearance in the text. After that, we used these values to record the building progress as the order of adding propositions to the learner’s map. Also for the SB-group learners, we gave values for all the propositions of every learner’s map, and recorded the building progress as the order of adding to the learner’s map.

2.2 Example of Map Building Progress

Monitoring

To be able to monitor the progress of map building, the system was modified to automatically upload the learner’s map to a server every one minute. At the end of each session, we will have a sequence of map versions (depend on session’s length) for each learner. Then, we assign a value for each proposition in the final map representing its appearance order in the text. By comparing these values with the learner’s building sequence, we could tell whether the learner follows the sentence by sentence style, i.e., his comprehending style is sentence by sentence comprehension.

![Computer data storage](https://example.com)

**Figure 1.** Sample of the text used in this experiment.

For example, Figure 1 shows a part of a simple text used in our research talking about computer data storage. Then, computer data storage called storage will be assigned value 1. As all learners following the KB-mapping method will build their maps using same kit (generated from the goal map), their maps will have the same propositions. Thus, we could use the goal map for assigning values for all the propositions of all learners’ maps. Figure 2 shows the order of the propositions following the text sentence sequence and considering the text in Figure 1.

On the other hand, learners of SB-mapping will have different propositions in their map as every learner is free to select the important nodes and links. Hence, we had to use the final learner’s map for assigning values for all the propositions of every learner’s map.
Figure 2. Sample of goal map of this experiment with the values (order) of the Propositions.

Table 1: Samples of the building records of learner’s map in this experiment.

<table>
<thead>
<tr>
<th>T.F</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>A.A.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>15</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>6</td>
<td>10</td>
<td>14</td>
<td>2.3</td>
</tr>
<tr>
<td>AD1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>LS2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>12</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>13</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>14</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>AD2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(T.F: Text Following sequence; A.A.D: Average Anagram Distance; LS1, LS2: Learners’ building Sequences; AD1, AD2: Anagram Distances of the two learners)

By doing so, we had the order of the propositions in the situation of following the text sentence sequence, which means that if a learner has the same building sequence, he will be building the map sentence-by-sentence, in other words, his comprehending style is sentence-by-sentence comprehension. For every learner, we had recorded the building sequence of the learner’s map by recording the sequence of propositions value during the process of building. After we got the building records for all the learners, we calculate the average anagram distance from the text following sequence. Anagram distance is calculate by the absolute value of the differences between the Text following Sequence and the learner’s map building sequence, \( AD = \text{ABS} (\text{TF} – \text{LS}) \). Where the TF is the order of proposition appearance in the text, and the LS is the order of adding propositions to the learner’s map. Table 1 shows examples of the records of building of two learners, one following the KB-mapping (LS1), and the other following the SB-mapping (LS2). The first row of the table is the order of Text Flowing sequence (T.F), and the others rows are the building sequences and the anagram distances of two learners. The last column is the average anagram distances for every learner’s building sequence from the text following sequence.

3. Results

We performed our experiment with 11 students in six sessions. In three, we had six participants (Group A) as KB-conditions group and five (Group B) as the SB-conditions group. In the other, the participants were shifted to the alternate conditions groups. So, we had 33 results as KB-conditions and 33 results as SB-conditions, we compared the CT average scores, the DCT average scores and the differences (DCT-CT). We could confirm again that the KB-mapping method has better efficiency in the DCT two weeks after the practicing as it shown in Table 2. We got a new kind of data from this experiment which is the records of building learner’s map of all learners as SB-conditions and KB-conditions. We analyzed this data in two ways to check what differences are between the two methods.

Table 2: The average difference (DCT-CT) for two conditions groups.

<table>
<thead>
<tr>
<th>DCT-CT</th>
<th>KB-group</th>
<th>SB-group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.55</td>
<td>-14.42</td>
</tr>
<tr>
<td>SD</td>
<td>10.23</td>
<td>9.43</td>
</tr>
<tr>
<td>(value)</td>
<td>0.0005</td>
<td></td>
</tr>
</tbody>
</table>

3.1 Following Text Sequence

The records of building of the two methods contain the building sequence during the building time so we analyzed the sequence of map building during the building time. For every session, for the KB-mapping method, we gave an order for all the proposition of the goal map, according to their appearance in the text, and recorded the building sequence as the order of adding propositions to the learner’s map. For the SB-mapping method, we gave an order for all the proposition of the learner’s map, according to their appearance in the
text, and recorded the building sequence as the order of adding propositions to the learner’s map. We calculate the absolute distance of every building sequence from the text following sequence and we found that the KB-group average distance of every session is higher than the SB-group one, as shown in Figure 3.

Figure 3. The average absolute differences for the two groups in all the sessions.

Also, we calculate the average Pearson product-moment correlation coefficient between the text following sequence and the building sequence of every learner in every session. We found that the SB-group building sequence has more strong correlation than the KB-group building sequence, so we can say that the SB-group, during the building process, followed the sequence of appearance in text. To check the effects of following text sequence, we calculated the average Pearson product-moment correlation coefficient between the text following sequence and the scores of the learners in the comprehension test and the delayed one for the two conditions group. We found as shown in Table 3, that there is a coefficient correlation between the scores of the SB-group and the building sequence and there is no correlation between the scores of KB-group and the building sequence.

Table 3: The Average correlations between the learners’ average absolute difference and scores.

<table>
<thead>
<tr>
<th>Session</th>
<th>S. 1</th>
<th>S. 2</th>
<th>S. 3</th>
<th>S. 4</th>
<th>S. 5</th>
<th>S. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>SB-CT</td>
<td>0.92</td>
<td>0.93</td>
<td>0.83</td>
<td>0.56</td>
<td>0.81</td>
<td>0.99</td>
</tr>
<tr>
<td>SB-DCT</td>
<td>0.47</td>
<td>0.77</td>
<td>0.80</td>
<td>0.50</td>
<td>0.58</td>
<td>0.85</td>
</tr>
<tr>
<td>KB-CT</td>
<td>0.22</td>
<td>0.17</td>
<td>0.13</td>
<td>-0.31</td>
<td>-0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>KB-DCT</td>
<td>-0.16</td>
<td>0.27</td>
<td>-0.13</td>
<td>-0.33</td>
<td>0.23</td>
<td>-0.24</td>
</tr>
</tbody>
</table>

From these results, we could confirm that the learners of SB-mapping method had follow the sequence of sentences in the text, but the KB-mapping ones had not.

The main result of this research is the relation between the building sequence and the text following sequence, we could confirm that the learners of SB-mapping method were following the sequence of the text. In other words, they are parsing the text sentence-by-sentence to generate the concepts and the relations from the text during the building of the learner’s map. The reader should notice, as we mentioned before, that this style of reading is not so effective for comprehending the text. That is because this style of reading does not help the learners to understand the text in a structural form, which means that the learners could comprehend the text as separated sentences or paragraphs. That will not help learners to keep their understanding for a long time. Subsequently, they could answer the comprehension test, but not the delayed test DCT.

In the other side, the learners of KB-mapping method were not following the sequence of the text, i.e., they are not parsing the text as the SB-mapping learners do, but they could answer the comprehension test as good as SB-mapping ones. Yet, they could answer the delayed comprehension test in a better way than SB-mapping ones do. So, we can confirm that the KB-mapping method helps the learners to understand the text in a more structural form and this understanding helps the learners in recalling the comprehended information later.

3.2 Considerations

As a results of this experiment, we confirmed again the results of our previous research (Alkhateeb & Hirashima 2015), that using the KB-mapping method has almost the same efficiency as using the SB-mapping method for comprehending English text just after the method use (the CT), so the two conditions groups could understand the text. But, the KB-mapping method has a better efficiency for recalling the comprehended information after some time had passed (the DCT). Another result, we could confirm that the provided kit, for the KB-mapping learners, does not give any underlined information or extra support for the building process in comparison with the learners of SB-mapping method who had to build all the map nodes and links by themselves because of the same evaluation of map size during the building process.

4. Conclusion and Future Works

In this paper, we described the effects of using KB-Mapping method as a supportive tool for the reading comprehension of English texts as EFL reading. Overall, from this research, we can conclude that using of KB-map as learning supportive tool for reading comprehension is as good as SB-mapping in the short term, but it so
better for the long term. This can be explained by the building process of the two methods, where the building sequence of the two methods indicated that the SB-mapping method learners had followed the sentences sequence of the text, but the KB-mapping method learners did not. As we mentioned, the SB-group learners had comprehended the text as individual parts, so their comprehension was good in the CT but they could not recall in the DCT. In the other side, the KB-group learners had comprehended the text as a whole in a more structural form, so their comprehension was good in the CT and they could recall more in the DCT.

The experiment shows that the map size has no effect on the reading comprehension process, i.e., the provided kit to KB-mapping method learners, has no hidden support to learners. That is to have a fair comparison with the SB-mapping learners who were not provided.

Our next step is to investigate the effects of learning methods for the learners who have different levels of reading abilities, and how to improve our method to support all kinds of reading and all levels of learners.

References