

Concept Mapping: Implementation in an EFL Classroom

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Abstract This study looks at the impact of student-generated, concept mapping on the performance of EFL, grade 12, students in reading comprehension texts. In doing so, 14 EFL, grade 12, students were selected from a high school in Israel. Students were tested on three separate occasions. First, students were given a tutorial on how to create a visual aid, more specifically concept maps, during reading. Then students partook in three lessons; whereby, they employed concept mapping strategies. After each lesson, students completed reading comprehension tests based on the text that they had read. In addition following each tests, students were interviewed in order to assess their disposition towards self-generated, concept mapping. The results indicate that self-generated concept mapping by low-knowledge students had a significantly greater influence on students' text comprehension than did the self-generated concept mapping by high-knowledge students or both control groups. In addition, students' disposition toward self-generated concept mapping had a progressive positive change, regardless of students' level.

Concept mapping, EFL, self-generated

Introduction

Reading is a process that involves numerous mental activities; therefore, in order for students to understand the main idea of a text, they need to employ tools which can advance text comprehension (Kang, 2004). Research has shown that visual displays have the potential for making content information more understandable to readers and offer assistance in making connections between concepts (Schnotz, 2002; Winn, 1994). Furthermore, the use of visual displays may be used as a tool which utilizes information from a text (Kang, 2004) and ultimately support the comprehension process while reading (Kang, 2004; Winn, 1994). In other words, visual displays, such as diagrams, maps, graphic organizers, and pictures (Hayati & Shariatifar, 2009; Kang, 2004) can be used as a type of reading strategy by possibly converting difficult information into a simplified layout (Kang, 2004).

Particularly, when reading in a foreign language where texts can be complex, there is a need to promote learning by using cognitive tools (Tergan, 2005). External, representations of text-relevant knowledge in visual form are proposed to aid readers' ability to deal with comprehensive texts in the EFL classroom (Kang, 2004). Notwithstanding the importance of students' active participation in the classroom, the nature and quality of visual displays is of paramount importance for the benefit of classroom experience that is intended to produce gains. Therefore, students' self-generated, external representations are important in learning as it can aid students in developing strategies to organize their knowledge which may affect their academic achievement (Tergan, 2005).

This study will focus on students' generated visual displays while they engage in reading texts in the EFL classroom. In particular, students will generate concept maps which represent EFL texts that students have read in the classroom.

Visual Displays

A self-generated, visual display shows a relationship between the object and its domain of reference (Kang, 2004; Winn, 1994) in an organized and explicit form (Tergan, 2005). Each individual feature may act as a representation of an idea of a larger construct (Schnotz, 2002, Winn, 1994), subsequently providing a structure for the integrations and subsequent recall of information (Winn, 1994). In the realm of education, a particular framework has the potential to aid students' learning through interacting with their background knowledge and the learning environment (Kang, 2004). In other words, visual displays, such as self-

generated concept maps, can be a useful educational tool which assists in learning and facilitating students' acquisition of meaningful and important information (Novak & Gowin, 1985, Schnotz & Kulhavy, 1994; Schnotz, 2002) as students actively build and interpret information (Kang, 2004).

Students' background knowledge is instrumental in determining how visual displays will be generated while reading a text. Through schematic representation, students begin to fine-tune their comprehension as they make connections with their background knowledge and the text at hand (Kang, 2004; Schnotz, 2002; Kalyuga, Ayres, Chandler & Sweller, 2003; Verdi & Kulhavy, 2002). Eventually, students learn how to educate themselves which can lead to a progressive change in their learning (Novak & Gowin, 1985). Hence, "Every activity, when carried to a point of sufficient proficiency, creates its own ... ways of thinking" (Novak & Gowin, 1985: 10).

Classroom interaction is linked to language learning; therefore, linguistic and cognitive knowledge are tied to students' active participation in socioculture events and activities (Hall & Walsh, 2002). Furthermore, effective learning which comes from active student participation can ultimately shape their language development (Vygotsky, 1978). Effective learning and increased motivation for a subject rely on educational experiences, appropriate subject matter and connecting previous schemas to new learning (Bruner 1978; Gardner, 1978) when knowledge is related to concepts already known (Novak & Gowin, 1985). Thus, the emphasis on students' prior knowledge is important in determining how students generate and process visual displays (Verdi & Kulhavy, 2002) during reading comprehension in an EFL classroom.

In determining educational objectives, emphasis should be put on the teaching method (Garret & Shortall, 2002; King, 1971). Recent research suggests that students need to be taught how to use language in ways that surpass prior experience; thereby, promoting growth (Poehner, 2007; Sternberg, 2007). Therefore, successful learning may occur when teachers supply students with diverse experiences, which cause them to actively toil over a task (Ghaith & Bouzeineddine, 2003). Previous studies have found that students who were using learner control with choices pertaining to instructional events in a lesson often outperformed students who were not in control of their studies (Craft, Chappel & Twinging, 2009; Klein & Keller, 1990; Schnackenberg & Savenye, 1997). Consistent with the link between diverse classroom experience and successful learning, Mason (1995) employed the use of students' original analogies in a science class. In addition, the study revealed that when students use self-generated analogies there was an increase in learning. Understanding the influence in learning through the use of multimedia, such as in visual displays, is essential to developing teaching methods (Butcher, 2006). Butcher (2006) extended the use of multimedia by investigating students' learning outcomes and processes when including diagrams. Shariatifar (2009) expanded the link between self-generated, special displays and mapping strategies in an EFL university course. The research showed that the graphic displays used in mapping strategies included the most important topics in the text. However, the results showed no gains were made by students who included mapping.

Tools employed in teaching methods are of critical importance to students' development (Hall & Walsh, 2002; Vygotsky, 1978); therefore, students' visual displays can assist students in noticing, ordering, and remembering items from the text (Novak & Gowin, 1985). One example of a visual display is concept-mapping which is used to present information. A concept map is a graphic representation that transmits basic information in addition to presenting hierarchical relationships and structures which may not be observable initially to the reader (Shariatifar, 2009). Maps make it possible to re-use and retrieve information, represent ideas and the relationships between them, as well as illustrating the way the reader perceives interrelationships (Chang, Chen & Sung, 2002). According to Novak & Gowin (1984), a concept map consists of nodes, representing concepts, and links that represent the relationships between concepts. The nodes are the main ideas and the links specify the relationship between the nodes as well as offering students a "skeletal representation" of the text (Hayati & Shariatifar, 2009, p. 55, Novak & Gowin, 1985, Tergan, 2005). The main goal of concept maps is to assimilate new information with previously learned material which may lead to higher comprehension and possibly exceed difficulties in comprehending texts (Novak & Gowin,

1985) across a variety of frameworks (Chang, Chen & Sung, 2002, Shariatifar, 2009). Concept maps, can serve as a scaffold to cognitive development as they may lower cognitive load, enhance connections between complex constructs, and offer paths for retrieving and accessing knowledge (Novak & Gowin, 1985; O'Donnell, Dansereau & Hall, 2002). Moreover, concept maps can make the macrostructure of a text more salient by providing a visual roadmap showing ways to "connect meaning to concepts," (Novak & Gowin, 1985: 20) as it allows previous knowledge to be incorporated into new ideas (Adema-Hannes & Parzen, 2005). This finding is consistent with other research (Hall, Dansereau & Skaggs, 1992 ; Rewey, Dansereau & Peel, 1991), indicating that students who employed the use of concept maps recalled more information.

Consistent with the link between concept maps and higher comprehension, students' self-generated, concept maps can be used as a mediating tool in order to raise students' performance to a level that they could not have achieved on their own (Vygotsky, 1978). Nesbit and Adesope (2006) reviewed 55 quasi-experimental studies in which students learned by creating, changing, or viewing node-link diagrams. The review argued that the use of concept maps was associated with elevated knowledge retention across an extensive scope of educational levels and subject areas.

In addition, research (Novak & Gowin, 1985; BouJaoude & Attish, 2003; Brandt, Elen, Hellerman, Heerman, Couwenberg, Volckaert & Morisse, 2001; Stensvold & Wilson, 1990) has shown that concept mapping is a skill that needs time for mastery and improvement. Furthermore, it is most effective if used continuously over the course of instruction (Brandt, *et al.* 2007). BouJaoude and Attish (2003) claim, that when students create concept maps repeatedly, they may acquire skills to revise and modify their mapping techniques which can lead to better understanding. Taken together, research provides emerging evidence that visual displays assist students in creating learning schemas which support connections between what is already known and what is learned in the classroom (Craft, Chappel & Twining, 2009; Ghaith & Bouzeineddine, 2003; Klein & Keller, 1990; Schnackenberg & Savenye, 1997). However, there is a lack of research which studies the effects of concept mapping in EFL high school classes. The present study attempts to fill the current literature gap by including students' self-generated concept mapping in a grade 12, EFL class, in Israel.

Cognitive Load and Instruction

Traditional methods of teaching may heighten cognitive demand, which can lead attention away from important aspects in learning (Chandler & Wales, 1991). Furthermore, not all learning activities appropriately direct attention for better learning and lower cognitive load. The cognitive load theory proposes that effective learning material aids achievement by directing cognitive resources toward activities that are pertinent to learning instead of towards activities that do not promote learning (Chandler & Wales, 1991). In the case of reading comprehension, students begin to interact with the text in order to further their comprehension. However, some students may be subjected to cognitive overload as they strive to integrate new semantic elements with the text's meaning (Coots & Snow, 1980). Cognitive overload may occur because students do not possess cognitive strategies for text organization skills which can occur in any reader, yet more likely among poor readers (Garner & Alexander, 1989). Poissant, (1994) obtained results in accordance with students' lack of cognitive strategies which can decrease cognitive overload insofar as low-literate readers had difficulty finding similarities between concepts in reading comprehension as opposed to the literate readers. Thus, students' attention may become misguided and cognitive abilities could be directed at tasks which are not advantageous to learning (Chandler & Wales, 1991).

Low-literate readers may lack the schemas necessary to process information in their working memory; therefore, guidance in the form of concept maps can act as a surrogate for the missing schemas (Kalyuga, Ayres, Chandler & Sweller, 2003) Furthermore, without any form of instructional guidance, low-literate readers may succumb to cognitive load, which can lead to inefficient learning (Artino, 2008). However, high-literate learners are able to use relevant schemas; therefore they don't necessarily need added instruction

(Svensvold & Wilson, 1990). If, however, high-literate learners are provided with instruction and they are unable to evade using the information which is in the form of redundant instruction, they may face cognitive overload (Artino, 2008), resulting in expertise reversal effect (Kalyuga, Ayres, Chandler & Sweller, 2003). Thus, it might be more beneficial for high-literate learners to be exempt from instructional guidance, which may reduce cognitive load, thereby improving learning. Kalyuga, Chandler and Sweller (1998) proposed that for more experienced learners, removing repetitious material is more beneficial because it lowers the cognitive load that is related to processing repetitious information. Kalyuga (2007) provides an explicit example of expertise reversal effect by suggesting that comprehensive external guidance given to knowledgeable learners can hamper their learning in relation to the degree that they could have attained with nominal instruction. Moreover, teaching methods and tools that are optimal for low-knowledge learners may obstruct the performance of more knowledgeable learners (Kalyuga, 2007).

This research attempts to fill the literate gap pertaining to the use of cognitive strategies, more specifically, concept mapping, which can elevate grade 12, EFL students reading comprehension.

Purpose of the Study

The purpose of the study presented here is to investigate the impact of the adoption of student, self-generated, concept mapping while reading texts in a grade 12, and EFL high school. To this end, two questions will be addressed.

1. How has students' reading comprehending developed throughout the process of student-generated, cognitive mapping in a foreign language?
2. What are students' dispositions toward self-generated, cognitive mapping while engaged in reading comprehension in a foreign language?

Method

In order to ensure the use of triangulation and to improve validity and reliability in the research (Patton, 2002); the sources of data included semi-structured interviews, a focus group, and document analysis-assessment of three tests completed after every lesson. Transcriptions were written from semi-structured interviews and focus group.

The search for meaning from the transcribed data began with identifying smaller units of meaning in each individual source of data (Creswell, 2003; Maykut & Morehouse, 1994) by highlighting key units and writing relevant notes pertaining to each data source. From all sources of data, reoccurring concepts, phrases, topics, patterns, and themes were generated in order to discover what is relevant in the data (Maykut & Morehouse, 1994). In addition, SPSS was used for the descriptive analysis of tests.

Participants for this study were recruited from a grade 12, EFL classroom in Israel. The participants produced maps composed of concepts which represented the content of comprehensive texts in an EFL classroom. In the experimental group, student generated concept mapping was used. The participants were divided into two groups according to their levels: low-knowledge learners AND high-knowledge learners. The control group, which did not partake in self-generated concept mapping, was divided into two groups, which represented both low and high knowledge learners.

Procedure

The training in concept mapping included a twenty minute presentation of mapping techniques, followed by one guided practice lesson. The mapping technique demonstrated was a modification of Novak and Gowin's (1984) educational application of concept mapping. In this approach, students were introduced to the construct of a concept and the connection concepts have to them personally. Next, students were shown

procedures that aided in sorting out particular concepts from the text in order to identify relationships between them. Novak and Gowin (1984) stress the importance of maps which "present a way to visualize concepts and hierarchical relationships between them" (28).

In all three sessions, participants were given ninety minutes to create a map according to the text that the class read. Low-knowledge learners and high-knowledge learners were given different text which reflected the specific levels of the students. While the participants worked on their maps, the researcher was available to answer any questions about the texts and to offer advice about creating self-generated maps. Upon completion of the self-generated concept maps and reading the texts, students were given a test. During the tests, students were privy only to the text and the researcher did not answer any questions about the test or the text. The tests were comprised of a reading comprehension text in English. Each test consisted of open ended and multiple choice questions, in addition to writing a composition of 120 words on a specific topic. In addition, students partook in an interview after each session in order to achieve the effect of mapping on their academic achievement and their disposition toward self-generated mapping while reading a text in English. The duration of the research was over a three week period.

The self-generated, concept maps were used to provide data in charting the relationship between students' academic achievement as they were involved in self-generated mapping. The maps were analyzed hermeneutically, whereby the emphasis was placed on expressions of comprehensible meaning (Gahremani-Ghajar & Mirhosseine, 2005) and no formal grade was given to the maps.

Results

The data collected and analyzed included: (a) scores for reading comprehension tests; (b) focus group prior to research; and (c) students' responses to interviews following each test.

Students' mean scores and standard deviations are presented in Table 1. It is evident that for all three tests, mean scores for self-generated, concept maps in low-knowledge students were higher and students' achievement was more homogeneous, compared to self-generated, concept maps in high-knowledge students. Furthermore, whereas a marked improvement from test1 to test3 (53, 66, 77) characterizes the achievement of low-knowledge students who engaged in self-generated, concept mapping. No such improvement is evident for the high-knowledge students, from test1 to test 3 (68.2, 63.4, 65.4), who employed self-generated, concept mapping. This difference in improvement over three tests indicates that the self-generated, concept mapping for low-knowledge students set a different learning process compared to high-knowledge students.

Table 1: Means and Standard Deviations for Low and High Knowledge Students

Students' Level		Test1	Test2	Test3
Low-knowledge students	M	53.0	66.0	77.0
	N	4	4	4
	SD	7.34	4.69	8.20
High-knowledge students	M	68.2	63.4	65.4
	N	4	4	4
	SD	12.9	11.0	9.60

Note. N=Number of subjects; SD=Standard Deviation; M=Mean

Table 2, reveals that high-knowledge students' test scores for test4 (70.8) increased more significantly than when they did not engaged in self-generated concept mapping. There is an increase of 5.4 points when high knowledge students did not employ self-generated concept mapping.

Table 2: Means and Standard Deviations for Test Scores of High Knowledge Students

Students' Level		Test1	Test2	Test3	Test4
High-knowledge students	M	68.2	63.4	65.4	70.8
	N	4	4	4	4
	SD	12.9	11.0	9.60	10.5

Note. N=Number of subjects; SD=Standard Deviation; M=Mean

The scores for both control groups, low-knowledge (64.0, 76.6, 55.6) and high-knowledge (57.5, 66.0, 61.0) students, did not demonstrate any significant influence on students' text comprehension (see Table 3).

Table 3: Means and Standard Deviations for Test Scores of Control Group

Students' Level		Test1	Test2	Test3
Low-knowledge students	M	64.0	76.6	55.6
	N	3	3	3
	SD	9.64	13.86	6.11
High-knowledge students	M	57.5	66.0	61.0
	N	3	3	3
	SD	9.19	5.65	8.48

Note. N=Number of subjects; SD=Standard Deviation; M=Mean

In summary, self-generated, concept mapping by low-knowledge students had a significantly greater influence on students' text comprehension than did the self-generated, concept mapping by high-knowledge students or both control groups. In other words, in comparing the mean scores of the three groups, low-knowledge students, high-knowledge students and two control groups, on the reading comprehension tests, a significant difference among students' performances in the three groups occurred. Low-knowledge students, scored the highest and made the greatest gains throughout the testing followed by high-knowledge students and the control groups respectively. This suggests that the use of student self-generated, cognitive mapping during reading comprehension has significant outcomes on students' performances, when they are engaged in reading a text in a foreign language, particularly English.

Students' responses to the interviews were used to determine their disposition towards self-generated cognitive mapping. In a focus group, prior to students' use of self-generated, concept mapping revealed that low-knowledge students had lower self-confidence (100%), felt that they needed additional help (100%), thought that mapping would improve their understanding of text (66.6%) as well as possibly causing them to think differently while reading (33.3%). In addition, none of the low-knowledge students thought that their attendance would improve or that mapping would not cause improve in their grades. Conversely, high-knowledge students stressed less that they needed additional help (66.6%), thought that mapping would improve their understanding of text (33.3%), and had lower self-confidence (33.3%). In addition, high-knowledge students stated that self-generated mapping would not increase their grades (33.3%) and their attendance would improve class (33.3%). Furthermore, students did not think that self-generated mapping would cause them to think differently while reading a text. In addition, both high and low knowledge students stated that they were excited about self-generated mapping (33.3%- see Table 4).

Table 4: Students' Dispositions Concerning Self-generated Concept Mapping Prior to Instruction

Group	N	Need additional help	Show low self-confidence	Think differently while reading due to mapping	Grades will not improve as a result of mapping	Excited about mapping	Attendance will improve as a result of mapping	Understanding of text will improve as a result of mapping
Low knowledge students	3	100%	100%	33.3%	0%	33.3%	0%	66.6%
High knowledge students	3	66.6%	33.3%	0%	33.3%	33.3%	33.3%	33.3%

In the first interview after students engaged in self-generated, concept mapping both low and high knowledge students were in agreement pertaining to their negative disposition concerning self-generated mapping. Students in the low knowledge group stressed that mapping was "a waste of time" and "very hard." Similarly, high knowledge students acknowledged that, "...personally it didn't help...It mostly disturbed me than to help me, I am used to a certain method when I do unseens. I just do unseens and this interrupted me." In addition another student stated, "I hate this... it takes more time." In addition, one representative from each group showed a positive attitude when involved in self-generated, concept mapping: "Yes it helped me understand more." Only high knowledge students stated that self-generated mapping hindered their ability to read the text. This can be seen in the following examples, "Yes it was a lot of load on me but not only, because I got used to doing it differently and now it is something new" and "... but it takes more time to read and more pressure ." Both low and high knowledge students stated that self-generated mapping may have positive reading benefits. High knowledge students stated, "I read deeper, better ... to find something for the mapping in the text" and "I understand it better...the truth it is better to read this way." Similarly, low knowledge students said: "...first I read more comprehensively and do the mapping. Then read again and check what I did" and "I will read every paragraph and summarize and check. Summarize every paragraph and write a sentence to summarize what the main idea is in general for all."

In the final interview, all low-knowledge students expressed a progressive change in their comprehensive reading throughout the research (see Table 5). All low-knowledge students stated that they did not read the text comprehensively in test1; however, in test2 and test3 students proclaimed that they read the text in a more comprehensive manner. This can be seen when D. stated: "I must read it [text] again because I need to do the mapping. And I need to understand the text in order to do it [mapping]. In contrast, there was no change in high-knowledge students' comprehensive reading. This is shown when one high knowledge student showed no significant change in the way the text was read: "I am just reading and answering the questions," as opposed to R, who said, "now I read all and write the main idea of each part (map)."

Table 5: Comprehensive Reading of Text

Group	N	Test1	Test2	Test3
Low knowledge students	3	100% - no comprehensive reading	100% - comprehensive reading	100% - comprehensive reading
High knowledge students	3	66.6% - comprehensive reading 33.3% - no comprehensive reading	66.6% - comprehensive reading 33.3% - no comprehensive reading	66.6% - comprehensive reading 33.3% - no comprehensive reading

In the final interview (see Table 6) both low and high knowledge students were in agreement pertaining to their improved understanding when they were involved in self-generated, concept mapping. This can be seen in the following examples: "I understand the text more from the mapping," and "it helped me to understand the material better." In addition, both groups stated that self-generated mapping caused them to read differently because "... if you don't understand the text, you can't do the mapping. If I can't do the map then I failed." Another student claimed that self-generated, mapping helped him read more comprehensively and without mapping he wouldn't have read the text he would "read the questions and then look for the answers in the text." Students in the low-knowledge groups had higher positive dispositions about self-generated mapping than the high-knowledge students (66.6%/ 33.3%). However one low knowledge student felt that "it (mapping) is a waste of my time." In addition, low knowledge students stated that as a result of self-generated mapping they read the text more than once (66.6%); however 66.6% of the high knowledge students said that they only read the text once. Finally, both groups created comprehensive maps. For example: "I read ... and wrote the main idea (in the map)" and "I wrote that he (Armstrong) created the organization (points to map)...then I extended the idea (points to the arrows in the map) that he (Armstrong) helps people..."

Table 6: Students' Responses to Self-generated Concept Mapping after Research

Group	N	Disposition Positive/ Negative	Read text differently	Read text many times	Improve understanding	Created Comprehensive Map
Low knowledge students	3	66.6% Positive	100%	66.6% Read text more than once	100%	100%
High knowledge students	3	33.3% Positive	100%	66.6% Read text once	100%	100%

Discussion

Using student-generated, concept mapping resulted in better achievement in comprehending EFL texts in grade 12 for low-knowledge learners as opposed to high-knowledge learners. Results showed that the mean scores for three progressive tests were higher for the low-knowledge learners than that of both the high-knowledge learners and the control groups.

The technique of student, self-generated, concept mapping as a tool, placed students in a novel experience which involved them in an active process of comprehensive reading. This would lead to the

conclusion that self-generated, concept mapping might be favorable for all students, but this is not the case. The significant benefits of using self-generated, concept maps with low-knowledge learners and elevated grades can be interpreted by suggesting that concept mapping may provide students with a way to attend to difficult information by incorporating new information with previously learned material (Novak & Gowin, 1985) in a comprehensive EFL text. Moreover, concept maps may offer low-knowledge students guidance in necessary schemas that are important in learning (Kalyuga, Ayres, Chandler & Sweller, 2003). Conversely, high-knowledge learners showed no significant effect from concept mapping in their learning. This result is similar to other research where a treatment may interfere with students' customary approach to learning and comprehension (Brandt, et al., 2001; Stensvold & Wilson, 1990).

What deserves attention is the lack of achievement for the high-knowledge students when they were engaged in self-generated, concept mapping. The mapping may have caused high-knowledge students to direct their cognitive resources toward activities that are not pertinent to learning (Chandler & Wales, 1991) as they already possess the relevant schemas that are effective in learning (Stensvold & Wilson, 1990). This can be seen when because high-knowledge students' achievement level elevated when they did not engage in self-generated, concept mapping. High-knowledge learners may prefer to use a different style of learning from that required which may ultimately improve their learning (Kalyuga, 2007). In other words, self-generated, concept mapping might be a form of redundant instruction which can hinder advancement (Artino, 2008). In this study, generated concept maps for high knowledgeable students may have limited their understanding of the text (Kalyuga, et al., 2003). The same results were found by Stensvold and Wilson (1990) when comprehension tests were lower for high-knowledge students who created their own concept maps than those that did not. Conversely, low-knowledge students, who constructed their own concept maps scored higher. Hence, research suggests that concept maps may have a limited effect on high-knowledge students (BouJaoude & Attieh, 2003; Stensvold & Wilson, 1990).

Studies have shown that construction of concept mapping is a difficult (BouJaoude & Attieh, 2003; Novak & Gowin, 1985; Stensvold & Wilson, 1990) and that students need extensive training to master the technique (Novak & Gowin, 1985). Both groups expressed initial difficulty in creating self-generated, concept maps. The low-knowledge learners, despite initial difficulty in creating concept maps, revealed a progressive advancement in their test scores. In addition, it is possible that self-generated mapping caused the low-knowledge learners to increase their repeated readings of each text. As opposed to the high-knowledge learners, who did not increase the number of times that they read each individual text and showed no advancement in test scores.

Other findings emerged when analyzing the data from students' interviews. Analysis of students' answers during the final interview revealed both groups created comprehensive maps regardless of students' level. These results indicate that all students mastered concept mapping skills, despite either group's test results. As concept-mapping was a new and different technique, students developed an understanding of it; however, the mapping may have complicated rather than facilitated knowledge acquisition for the high-knowledge learners (Brandt et al., 2001).

This study revealed that students' disposition toward self-generated concept mapping had a progressive positive change, regardless of students' level. One reason posited for this is that effective learning and increased motivation for a subject rely on educational experiences, appropriate subject matter and connecting previous schema to new learning (Bruner 1978; Gardner, 1978). In determining educational objectives, emphasis should be put on the teaching method (Garret & Shortall, 2002; King, 1971). Therefore, successful learning may occur when teachers supply students with diverse experiences. Furthermore, real development transcends learning only when students toil over a task (Ghaith & Bouzeineddine, 2003). Recent research suggests that students need to be taught how to use language in ways that surpass prior experience; thereby, promoting growth (Sternberg, 2007). Confirming this perspective are results indicating that cognitive mapping aids students in identifying main ideas in the text and ultimately gaining information

from the text (Hayati & Shariatifar, 2009). Thus it is possible that self-generated concept mapping caused students to process the text at a deeper level.

Conclusion

This study provides some insight into the use of concept mapping as a tool in the EFL classroom. It offers significant results concerning the differentiated effect on low and high knowledge students' performance in comprehensive reading of texts in English for non-native speakers. In so much as, self-generated, concept mapping by low-knowledge students had a significantly greater influence on students' text comprehension than did the self-generated concept mapping by high-knowledge students or both control groups. In addition, the results of this research exposed students' progressive affective change pertaining to self-generated mapping, regardless of advancement in grades. Although there is ample research pertaining to the use of concept mapping in many classrooms (BouJaoude & Attish, 2003; Chang, Chen & Sung, 2002; Novak & Gowin, 1985; O'Donnell, Dansereau & Hall, 2002; Shariatifar, 2009), there is a lack of empirical research in the EFL classroom. In addition, to the best of my knowledge there is no research that compares students' self-generated, concept mapping and their disposition towards this activity in the EFL classroom.

However this study is not without limitations. First, it is difficult to draw strong generalizations from one study with a small population. Secondly, the duration of the study took place over a short period of time; whereby, students produced only three concept maps. Students may have needed more time to get a better command of generating concept maps. Moreover, both groups did not read each text the same amount of times, which may have caused a difference in test scores.

The results of this study showed that students increased their understanding of comprehensive texts English, as well as an elevation in students' positive disposition regarding self-generated, concept mapping, regardless of improvement in their grades. In addition it showed that students, self-generated, concept-mapping had a differential effect on achievement in reading comprehension for low-knowledge learners. Consequently, self-generated, concept-mapping can be used to engage students in constructing and altering their own knowledge schemas. Nevertheless, self-generated, concept-mapping may become more effective in helping high-knowledge learners too, if they are encouraged to repeatedly reread each comprehensive text while they are engaged in mapping. If after repeated attempts at mapping and there is no significant advancement it may be wise to heed to previous research and not use self-generated mapping with high-knowledge students.

From a theoretical perspective, little attention has been paid to students' comprehensive development and dispositions toward the process of student-generated, cognitive mapping in a foreign language. Therefore, more research needs to be done on the use of self-generated, concept-mapping, in the EFL classroom. In addition, future research should focus on self-generated mapping and high-knowledge students so that they do not encounter the expertise reversal effect. Moreover, new studies should be done to further test the effects of self-generated, concept-mapping with larger number of students, at different levels, and at different schools. Another recommendation is to use this technique in other subject levels.

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