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THE IMPACT OF CONCEPT MAPPING ON EFL STUDENT'S READING COMPREHENSION

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ABSTRACT

The present study investigated the influence of concept mapping on EFL student's reading comprehension ability. Concept maps are visual representations of knowledge which can be employed as a learning strategy by the learners to find the relationship between current knowledge and new information. They allow the learners to figure out how ideas are connected through representing knowledge in graphs. The major aim of the current study is to assess the effects of concept mapping on Iranian EFL student's reading comprehension in two high schools in Iran. In doing so, 80 pre-university students were randomly assigned to experimental (20 males & 20 females) and control (20 males & 20 females) groups. Then a pretest-posttest design was utilized. The results of the pretest indicated that the two groups were homogeneous with regard to their reading comprehension ability. The experimental group was taught to construct concept maps through brainstorming before reading each passage. Results of ANCOVA and T-test revealed that there was a significant difference between the two groups with students in the experimental group outperforming those in the control group in reading comprehension. The findings of this study could have some implications for teaching reading comprehension to EFL students.

Key Words: *Concept Mapping, Teaching Strategy, Reading Comprehension, Traditional Method*

INTRODUCTION

Reading has been the subject of research study for over a century. Mark Clarke (1980) calls reading 'the most thoroughly studied and least understood process in education today'. Reading can be seen as an interactive process between a reader and a text. In this process the reader interacts dynamically with the text as he/she tries to elicit the meaning. Reading is the recognition of printed or written symbols, which serve as stimuli for the recall of meanings built up through the reader's past experience. It has also been described as a process of translating alphabetical symbols into a form of language from which the native speaker has already derived the meaning. According to Lawal (1996), readers use the symbols to guide the recovery of information from their repertoires and subsequently use this information to construct interpretations of the message. Adewole (2001) describes "critical reading skill," which students need to read, explore, and appreciate a literary text effectively. The ability to read is a crucial skill for information retrieval (Dike, 2006). Oyerokun (1993) emphasizes the need to use appropriate techniques and materials in teaching. She further states that in order to achieve this, the school, teacher, and parents should work together to ensure improvement in reading performance. Reading comprehension is the ability to understand what we read where words have context and texts have meaning. Comprehension becomes especially important to students in the later elementary grades (Sweet and Snow, 2003) because it provides the foundation for further learning in secondary school. A student's academic progress is profoundly shaped by the ability to understand what is read. Reading comprehension can be understood as the process through which the recognized words are transformed into a meaningful idea (Hoover and Gough, 1990). Reading is vital for academic achievement and is an important and necessary skill for successful functioning as a competent adult in today's society (Human Resources and Social Development Canada, 2003c). Comprehension is the reason for reading, comprehension is a highly complex cognitive process involving the intentional interaction between the reader and the text to

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meaning (National Reading Panel, 2000). Effective learning which comes from active student's participation can ultimately shape their language development (Vygotsky, 1978).

In the traditional method students are expected to read a variety of texts which differ in content, and readability. They are not interested in what they are reading. They do not interact with the text they read. The teaching style is heavily teacher-centered and many of the activities in their classrooms are focused on rote learning. Learners who struggle with comprehension possess inefficient strategies and use them inflexibly. They are usually unaware of what good comprehenders do and need to be shown how and when to apply a small repertoire of comprehension strategies. As Baker and Brown (1984) point out, such kind of awareness and control of one's reading activity, or the ability to monitor one's own comprehension, is highly important. This is supported by Brown and Smiley (1978) who noted that only about half of the eighth graders in their analysis, when given an opportunity to study content material, revealed any sign of strategy use. Providing students with explicit instruction in comprehension strategies can be an effective way to help them overcome difficulties in understanding texts (Graham and Bellert, 2004). Teaching reading has not been given much care in our schools and universities. However, a large number of EFL students still have poor reading comprehension. The problem occurs not only at the elementary level but also at the high school education and the higher education. Our students are not taught how to learn; rather the burden of learning is dependent upon the student's own ability in organizing and structuring information into memory. They also have difficulty tying information throughout a text together and making inferences with that information. The students who have low ability in reading comprehension cannot reorganize the information learned from the text and cannot connect their own knowledge to the new information received from the reading text, and most students lack motivation to read.

Teachers are always looking for innovative ways to help students improve their reading comprehension. From among various types of learning strategies, reading comprehension strategies have long been recognized by researchers of second/foreign language reading (Brantmeier, 2002; Janzen, 1996; Slataci and Akyel, 2002). Reading strategies have been defined by some theorists. They are referred to as mental operations which are used by readers when they read a text and try to understand it effectively (Barnett, 1988). In the past, reading was considered a relatively static activity. General meaning was imbedded in the text, and the reader's job was to understand what was being transmitted via the words on the page. Current researches view reading as a more dynamic process in which the reader "constructs" meaning based on information s/he gathers from the text. The teacher acts as both the facilitator and instructor where the learners are engaged in "active interactive strategic processes" that develop meaningful comprehension (Cassidy *et al.*, 2010). Anderson and Pearson (1984) contended that the reader comprehends a text by actively constructing meaning internally from interacting with the materials that are read. 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). Many studies have been conducted in recent years regarding how to find ways influential in enhancing reading comprehension of students. Visual illustrations can help EFL students with comprehension. In addition to pictures, teachers can utilize graphic organizers to help students make connections between key ideas. Concept Maps have been highly recommended and widely used in first language (L1) as well as second language (L2) instruction by language teachers. Concept mapping as a learning strategy changes the learning direction from teacher-based to student-based by activating the learner in learning process. Concept maps are universal in nature. They may be applied to expand learning and success of many students, including those who may be intellectually gifted to those with mild learning problems (Ellis, 2004). The aim of the present study is to find out whether concept mapping as a teaching strategy has influence on EFL reading comprehension.

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Review of the Literature

Concept Mapping

In 1972 concept mapping was for the first time introduced by Joseph Novak to broaden concept learning in science education. Concept maps are graphical instruments that are used for organizing and representing knowledge. They consist of concepts, usually positioned in some form of circles or boxes, and the relationships between concepts are shown by a connecting line linking two concepts. Words on the lines referred to as linking words or linking phrases, show the relationship between the two concepts (Novak and Canas, 2008). Propositions consist of two or more concepts connected with other words to form a meaningful statement. We call these statements the semantic units. In addition, the combination of concepts and the direction of linking line determine the map structure e.g. hibernacula or non-hierarchical fashions (Yin *et al.*, 2005). Concept Mapping has proven to be an effective pedagogical tool and a meta-learning strategy useful for many subjects (Ritche and Volkl, 2000; Gardgill and Jitendra, 1999; Novak, 1990). Concept is defined as "a perceived regularity in events or objects, or records of events or objects, designated by a label" (Novak and Canas, 2006). Two main theories support the use of concept mapping in education. One is Constructivist theory which implies that learners take with them their previous knowledge to class which is influenced by cultural and ethnic factors (Colburn, 2000). Constructivists believe that the way individuals understand their experiences forms meaning. In other words what we know is constructed by our personal experience. When we want learners to learn meaningfully, connections between novel and previous information should be made (Lambert *et al.*, 2002). Another theory which supports concept mapping is Ausubel's assimilation theory. Ausubel (1968) classifies learning into two categories: a) meaningful and b) rote learning "meaningful learning happens when the learner consciously and deliberately chooses to relate new knowledge to knowledge the learner already knows" (Novak, 1998; Shimerda, 2007). It is believed that concept mapping can contribute to student's learning based on mentioned theories. Therefore, causes an improvement in academic abilities and proficiency (Laight, 2004; Peterson and Snyder, 1998) and also increasing the student's marks (Marangos, 2000). Wang *et al.*, (2008) introduces concept map as an educational technique that links new information to prior knowledge structure and introduces conceptual understanding through meaningful showing of concepts. There are two approaches to concept mapping in the classroom: learner-constructed concept map and expert-construct concept map (Liu *et al.*, 2010). In learner-constructed concept map strategy, the teacher asks the students to construct a concept map (after it is introduced and demonstrated). This strategy aids the students to recognize relationships, textual structures, and important concepts. (Boyle and Weishaar, 1997; McCagg and Dansereau, 1991). The expert-constructed concept map is often used for practice and training in the comprehension of texts or passages. Because expert-constructed maps are developed by the instructor, they have a time-saving advantage over learner-constructed concept maps (Jonassen *et al.*, 1993). Both these strategies can be useful in the class, and the appropriate alternation of using these two methods may contribute to meaningful learning. 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). Knowledge is stored in our brains as a network of inter-connected concepts and propositions. When we learn something new, it's crucial to integrate connections between new and existing concepts into our cognitive structure.

Educators consider concept hierarchy and cross-concept links the most important features of concept maps (Douma and Ligierko, 2009). Although a concept map is normally regarded as a network structure, in order to aid learning and understanding, sections of a given concept map can be regarded as hierarchical tree-like structures. When a concept map is organized in a hierarchical fashion, the more general and more inclusive concepts should be at the top of the map, with progressively more specific (and less inclusive concepts) arranged below them (Novak and Gowin, 1984). The hierarchical attribute of a concept map also makes meaningful learning proceed more easily as new concepts or concept meanings are subsumed under broader, more inclusive concepts (Novak and Gowin, 1984). Concept maps are graphical tools for organizing and representing knowledge. They are used to categorize information

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into a graphic form, create a visual representation of the concepts within the text, the relationships among them and the text structure (Sturm and Rankin-Erickson, 2002). They include concepts enclosed in boxes and relationships between concepts through the use of connecting lines and words linking two concepts (Novak and Canas, 2006). Graphical tools convert a linear isomorphic text into a nonlinear graphic presentation, which makes the macrostructure of the text more salient. Their spatial properties help readers identify, compare and retain information or draw inferences about relations, supporting, in this way, cognitive processing that do not overload student's working memory. The content within a text becomes conceptually transparent and therefore it becomes easier for the readers, especially the ones with poor language and reading skills, to understand, retain and retrieve it (Chang *et al.*, 2002; Novak, 1991; Novak and Canas, 2006; O' Donnell *et al.*, 2002). Concept mapping is a meta-learning strategy that can be used to develop student's capacity to learn independently. It has been used successfully in many disciplines. Numerous educational applications of Concept Mapping can be identified. Including as:

- 1) A scaffold for understanding,
- 2) A tool for the consolidation of educational experiences,
- 3) A tool for improvement of affective conditions for learning,
- 4) An aid or alternative to traditional writing assignments,
- 5) A tool to teach critical thinking,
- 6) A mediating representation for supporting interaction among learners, and
- 7) An aid to the process of learning by teaching. Several studies were examined in which concept mapping was used to identify student's current understandings, misconceptions and conceptual change. Concept Maps have been used in collaboration and cooperative learning, and as a formal assessment tool. Concept Maps have been used to organize and present information, including use as an Advance Organizer, use by instructors for course or curriculum design, and use as a navigational aid in hypermedia (Canas, 2003). Numerous mapping systems have been developed that enable the graphical depiction of ideas and concepts, e.g., Concept Maps, Knowledge Maps, Mind Maps, Cognitive Maps, and Semantic Networks. Concept Maps differ from these other superficially similar types of representations in a variety of ways. The Concept Mapping method defined by Novak and Gowin (1984) involves a series of steps:
 1. Define the topic or focus question. Concept Maps that attempt to cover more than one question may become difficult to manage and read.
 2. Once the key topic has been defined, the next step is to identify and list the most important or "general" concepts that are associated with that topic.
 3. Next, those concepts are ordered top to bottom in the mapping field, going from most general and inclusive to the most specific and an action that fosters the explicit representation of subsumption relationships (i.e., a hierarchical arrangement or morphology).
 4. Once the key concepts have been identified and ordered, links are added to form a preliminary Concept Map.
 5. Linking phrases are added to describe the relationships among concepts.
 6. Once the preliminary Concept Map has been built, a next step is to look for cross-links, which link together concepts that are in different areas or sub-domains on the map. Cross-links help to elaborate how concepts are interrelated.
 7. Finally, the map is reviewed and any necessary changes to structure or content are made.

According to Chiou (2008), in a typical concept mapping class, the teacher first explains about usefulness of concept mapping tool for learning, elaborates on how concept mapping can be employed to illustrate relationships among concepts, and then students will be trained how to draw concept maps in accordance with the procedures suggested by Novak and Gowin (1984). After finishing a passage, the students are asked to use concept maps to represent what they had learned from the passage. The teacher then corrects student-constructed concept maps (Khajavi and Abbasian, 2013). Concept mapping may be conducted individually, or in groups. Individually developed concept maps allow students to discover important concepts and relations on their own time and terms. Therefore, these concept maps may allow the students

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to organize their own understanding. Studies have indicated that students who use individual mapping perform better on comprehension tests and have lower anxiety than those who do not (Jonassen *et al.*, 1993; Ojima, 2006; Sturm and Rankin-Erickson, 2002; Talebinezhad and Negari, 2007). Collaborative mapping involves building or sharing a concept map as a group. During this concept mapping process, students can interact, transfer, and exchange opinions with other members of their group. Some research studies suggested that collaborative mapping can improve social communication skills, and enhance learning motivation (Guvenc and Acikgoz, 2007; Hwang *et al.*, 2010; Kwon and Cifuentes, 2009). Ruiz-Primo *et al.*, (2001) suggested that the degree of control or directedness in map construction differs in different mapping tasks. Map builders can be given the structure of the Knowledge Map, and lists of concepts and linking words to use to fill in the slots in the graph (a fill-in task). At the opposite extreme, the creator may be required to provide all concepts and linking phrases (a graph-from-scratch task). Aside from encouraging the semi-hierarchical format, the method proposed in Novak and Gowin (1984) method is a low-directedness mapping task. Ruiz-Primo *et al.*, (2001) have suggested that graph construction tasks that are low in directedness may provide clearer insights into differences among student's knowledge structures.

Student's 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 *et al.*, 2003; Verdi and Kulhavy, 2002). Eventually, students learn how to educate themselves which can lead to a progressive change in their learning (Novak and Gowin, 1985). Concept maps have been used widely in different fields. Many studies have attempted to incorporate the use of concept mapping techniques to improve learner's reading comprehension ability at different levels. For example, Kuo *et al.*, (2002) investigated the effect of concept mapping to enhance reading comprehension and summarization. They designed three concept mapping approaches: Map correction, Scaffold fading and Map generalization to determine their effects on the reader's comprehension and summarization ability. The experimental results of 126 fifth grader showed that the map correction method enhances reading comprehension and summarization abilities and that the scaffold fading method facilitates summarization ability.

In a study by Chularut and DeBacker (2004), the effect of concept mapping on academic achievement, self-efficacy and self-regulation of students in English classes as a second language have been investigated. The subjects of the study were college and high school students that enrolled for English classes. The findings of the study showed that a group of students that used concept mapping, achieved higher scores in English achievement, self-efficacy and self-regulation in comparison to control group. Moreira and Moreira (2011) used concept mapping in a research in foreign language class as an instrument for context comprehension of course books and achieving meaningful learning. The findings of the study showed that text concept mapping is significant in student's meaningful learning and students got self-confidence in using learned concept mapping in new situations. The results of the aforementioned studies indicate that mind mapping technique can help improve student's reading comprehension ability. Khajavi and Abbasian (2013) investigated if concept mapping as a cognitive tool could contribute to improving self-regulation of students in a reading course. To fulfill the aim of the study, sixty university students from one of the universities in Iran were randomly assigned to two groups: one experimental (concept mapping) and the other control (conventional method). Results revealed that there was a significant difference between the two groups. The students in the experimental group outperformed those in the control group on self-regulation in reading.

The present work, thus, examines the impact of concept mapping on EFL reading comprehension.

Research Questions

The current study is designed to examine the effect of concept mapping on EFL student's reading comprehension. To do so, the study aimed at answering two questions as follows:

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- 1) Is there any significant difference between the reading comprehension of the students who use concept map strategy in the experimental group and reading comprehension of the students in the control group who use the traditional method?
- 2) Is there any difference between males and females in reading comprehension using concept mapping?

MATERIALS AND METHODS

The participants of this study included 80 (40 males and 40 females) EFL students. Prior to the study, 100 candidates took the OPT in order to choose a homogeneous sample from among them 80 students whose scores fell between one standard deviation below or above the mean were selected and randomly assigned to either experimental (concept mapping, 20 males and 20 females) or control (traditional method, 20 males and 20 females) group. A reading comprehension test as a pretest was administered to measure the comprehension ability of the students before applying the treatment. This test initially consisted of 30 multiple-choice items. Both experimental and control group classes were held 2 sessions per week lasting for 7 weeks. During the treatment the participants in the experimental group were instructed concept mapping technique but those in the control group were given information on the conventional teaching methods. In the first session the students became familiar with concept map, concept map characteristics, how to make concept map and some concept map samples. The following sessions included: text reading, focus questions, highlighting text concepts, map creating, reviewing and concept mapping which involved students in constructing the maps and filling the maps. There was a handout which was prepared by the teacher in order to teach students how to draw concept maps. At the end of the treatment, a parallel reading comprehension test, one with the same readability was administered to the participants in the control and experimental groups as a post-test. For the purpose of data analysis, the data on the pre-test and post- test were collected and analyzed with the SPSS program and quantitative approach was used for the analysis of the data. Mean scores on the pre-test and post-test were calculated. The analysis of the data was carried out using the ANCOVA and T-test.

RESULTS AND DISCUSSION

As noted earlier the purpose of this paper was the study of the effect of concept mapping on EFL student’s reading comprehension. The analysis of the data was carried out using descriptive statistics and inferential statistics. T test and one-way analysis of covariance (ANCOVA) were used to investigate the hypotheses. Null hypotheses included: 1). There are no statistically significant differences between reading comprehension of the students who use concept mapping strategy in the experimental group and reading comprehension of the students in the control group who use the traditional method 2). There is no difference between males and females in reading comprehension using concept mapping.

To examine the linear relationship between the auxiliary random variables and the dependent variable we investigate figure 1.

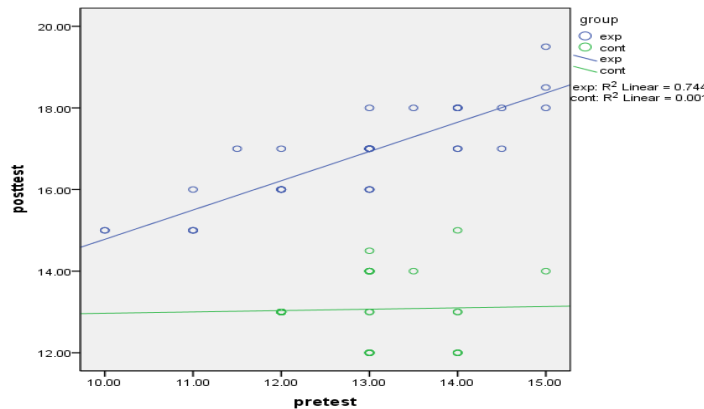


Figure 1: Level of achievement in the control and experimental groups

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A linear relationship between pre-test and post-test is shown in figure 1. The slopes of the regression lines are parallel, and the relationship between the two variables is similar in both groups. The amount of correlation between dependent variables is showed in table 1.

Table 1: The amount of correlation between dependent variables

Variable	reading comprehension (post-test)	p
Reading comprehension(pre-test)	.258*	0/021

$p^* < .05$

The result of correlation shows that there is a significant relationship between dependent variables. Therefore, running ANCOVA is possible. Tables 2 and 3 display the descriptive statistics of the two groups.

Table 2: Descriptive analysis of the pretest and the posttest and the results of the independent T-test of the study

Group	Mean	Std. Deviation	F	df1	df2	Sig.
exp	16.8250	1.06548	10.055	1	78	.002
cont	13.0625	.80214				

Table3: Paired Samples Statistics of pre-test and post-test In both groups

group	Mean	Std. Deviation	Std. Error Mean	T	Sig. (2-tailed)	
Experimental Pair 1	posttest	16.8250	1.06548	.16847	38.680	.000
	pretest	12.8500	1.28203			
Control Pair 1	posttest	13.0625	.80214	.12683	1.130	.266
	pretest	12.8625	.80851			

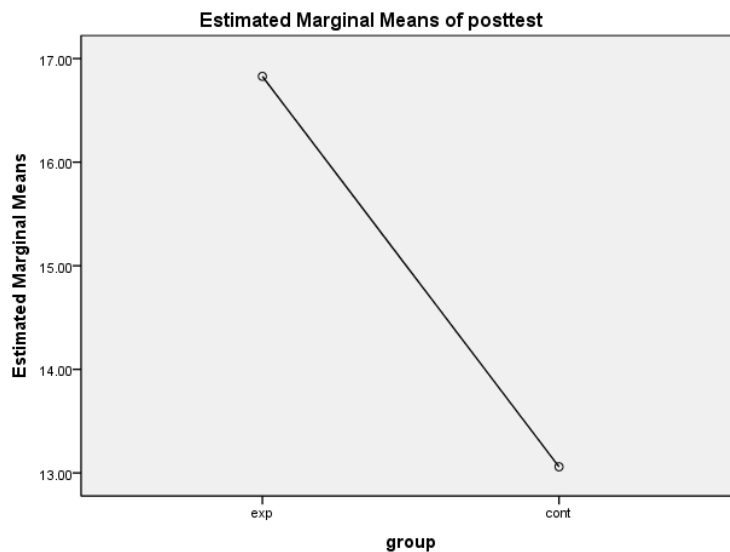
Table 3 indicates that there is a significant difference between the means of the experimental group in the dependent variable (post-test).

Table 4: The Results of ANCOVA in control and experimental groups

Variable	Source	df	Sum of Squares	Mean Square	F	p	Eta
Reading comprehension	Contrast	1	248.102	284.102	486.898	.000	.863
	Error	77	44.929	.583			

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As indicated in table 3, the F value for the group is $F = 486.898$ which is significant at $p = .000$, $\eta^2 = 0.863$, which reveals that group taught with Concept Mapping exhibited better performance as compared to group taught with Conventional Method. Hence, the first hypothesis is not accepted.



Covariates appearing in the model are evaluated at the following values: pretest = 12.8563

Figure 4: Means of post tests in the control and the experimental group

The above diagram shows clearly that there is a significant difference between the experimental and the control group. It confirms that EFL students that had treatment concept mapping gained higher scores in reading comprehension than the control group.

According to the second hypothesis, there is no difference between males and females in reading comprehension using concept mapping. The results of T-test on the performance of the students are shown in Table 5.

Table 5: Results of T-test on the performance of the students

Gender	M	SD	SE	MD	T	P
Male	1.8125	2.91259	.46052	.38750	.647	.520
Female	1.4250	2.424634	.38337			

Table 4 reveals that mean gain scores of males and females are 1.8125 and 1.425 respectively and mean difference (MD) is .38750. Calculated 't' value is not significant which clearly shows that boys and girls do not differ significantly in their mean gain scores when taught through Concept Mapping. Therefore, the second hypothesis stands accepted.

Conclusion

The ultimate goal of the present study was to investigate the effect of the instruction of concept mapping strategy in EFL student’s reading comprehension. The results showed a significant effect of the instruction of the concept mapping strategy on the student’s reading comprehension. The findings of this study have several important implications for educators, teachers and students. Concept mapping helps educators understand what students know by the process of externalizing this knowledge; it provides an observable and assessable record of the student’s conceptual schemata and starting knowledge points (Angelo and Cross, 1993). It encourages educators to become more open minded and flexible with

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student's various interpretations and perspectives. Awareness is important for the development of the effective strategies. Thus, educators should instill awareness and help learners develop more efficient strategies to learn. This means that the focus of courses shifts from teaching and presenting information to learning and creating meaning. Additionally, teachers can use concept mapping as an effective learning tool for assessing learner's understandings through their creation of concrete and/or graphic/visual representations. It allows a teacher to observe gaps in the student's knowledge in order to facilitate correct conceptions (connections).

Students can improve their understanding of the content by examining their mapping errors and correcting them by referring back to an informational source, like a textbook, or to a standard map. Concept mapping provides students with opportunities to become actively involved in their learning while linking knowledge to long term memory. Through the use of concept maps, students have opportunities to organize their thoughts in a concrete and/or graphic/visual format, while connecting concepts and linking prior knowledge to new knowledge. Related concepts become connected rather than fragmented. Concept maps also provide them with opportunities to think about their own thinking as they reflect on their conceptual understandings. The process of map drawing has a positive impact on student's awareness of the reading process and they can manage to have more control over reading comprehension in English by visually representing what is conveyed in the texts they read.

Suggestions for Future Study

This is certainly a topic that deserves further study. Therefore, in order to generalize the results for larger groups, the research should be extended its time and the study should have been involved more participants at different levels. Further explorations using longer training duration and more extensive reading materials along with participants of different levels of reading abilities are worth considering verifying the relative efficiency of different concept-mapping methods for enhancing text learning. Even given its limitations, this study has provided many ideas for ways to modify teaching practices. It seems that concept mapping can help to stimulate and challenge students to look deeper into their reading. The scope of this study was only limited to reading comprehension. It is suggested that in future research the scope should be expanded in terms of other three important skills; writing, speaking and listening. By making the scope wider, the researchers can get a clear view of the utilization of concept mapping in all aspects. Concept mapping is not the only answer to introducing meaningful learning activities in the classroom. However, the tool is symbolic of the kind of pedagogy we need to introduce to achieve the developmental goals of the early change agents in our profession.

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