

Teaching reading comprehension through concept map

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Abstract: This study aimed at investigating the effect of teaching English reading comprehension to Iranian students through concept mapping. In doing so, a pre-test and a post test were used. First 38 third grade high school female students in Karaj city were selected systematically and then they were divided into control and experimental groups randomly. The experimental group was thought using concept mapping, while control group was not exposed to such kind of teaching technique and the students in this group were thought in common way of reading comprehension teaching. The exam was made by a teacher which covered knowledge and meaningful learning in English reading comprehension. The high cognitive questions (analysis, combining, evaluating) were used to evaluate meaningful learning. A t-test was used to verify or reject the hypotheses. Data analysis shows that concept mapping technique has a significant effect on English reading comprehension ($t=3.388$, $df=36$, $p=0.002$)

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Introduction

Constructivism emphasizes on the active teaching methods which focus on student-centered activities and considers learning as a dynamic and internal process in which the learners acquire new knowledge through linking already learned information with the new one. Constructivists believe that the best teaching method is to determine what learners already learned first and then start teaching from that point (Ausubel et al, 1978).

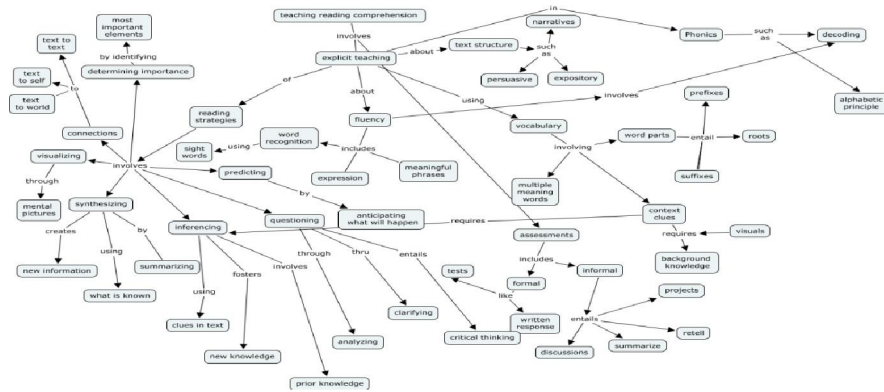
One of the new educational strategies that is consistent with constructivism learning theory (Duffy et al, 1991) and meaningful learning (Ausubel, 1968, Novak, 1991, 1992) is concept map. Concept map was proposed as the results of Novak's studies in Cornell University as an educational tool against rote learning in 1980s (Novak and Cannas, 2006). Novak's work was based on the cognitive theory of Ausubel who stressed the importance of prior knowledge in being able to learn new concepts. The most important single factor influencing learning is what the learner already knows.

Concept map is based on Ausubel's meaningful learning theory and derived from advance organizer concept in Ausubel's theory. According to Ausubel, the meaningful learning occurs when the learner can organize the information and link the prior knowledge to the new one in cognitive structure. Cognitive structure contains a set of organized principles, concepts and information that a person has already learned and fields of inquiry are organized like pyramid with the most general ideas forming the apex, and, more particular ideas and

specific details subsumed under them. The most inclusive ideas-those located at the top of the pyramid- are the prominent and most enduring elements in the hierarchy. They process a longer life span in memory than do particular facts or specific details, which fall at the base of the pyramid. Cognitive structure emphasizes the Horner's cognitive structure in the acquisition of new information. Present experience is always fitted into what the learner already knows. A cognitive structure that is clear and well organized facilitates the learning and retention of new information.

A concept map includes knots (concepts and terms) that link lines and also link concepts which specify the relationship between the concepts. Concept maps includes concepts usually enclosed in circles or boxes of some kind, and the relationships between concepts or propositions which indicated by a connecting line and linking word. Linking words on the line specify the relationship between two concepts. The label for most concepts is a word, although sometimes we use symbols. Propositions are statements about some object or event in the universe, either naturally occurring or constructing. 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 and et al, 2005).

The following diagram shows a concept map about reading comprehension teaching.



Concept maps can be used in various stages of the curriculum designing (Brulliard & Baron, 2000, Moen & Boersmn, 1997, Edmondson, 1995), before or in the learning process as an advance organizer (Bruillard & Baron, 2000, Novak & Novak, 1998, Willerman & Macharg, 1991) and after learning as an evaluation tool (Quinn et al, 2004, Rebich & Gautier, 2005, Williams, 2004).

Concept maps are used as a learning and educational tool in different scientific fields and they are suitable tools for presenting and organizing knowledge. Concept maps facilitate the meaningful and long-life learning knowledge through presenting a pattern and a framework (Novak & Cannas, 2006, Liaght, 2006). Although, concept maps have been used as a purposeful educational tool widely and successfully in different educational fields, mostly they have been used in the field of technical sciences, especially in first language and there are a few studies on second language. A lot of Iranian students have problem in English reading comprehension. Not only the high school students have this problem, but university students also do. In spite of the fact that students start Studying English from sixth grade and continue to the last year of high school, they use the meaningful learning techniques a little and the results of institutes exams, final exams, and national entrance exam show that the English level of students is low and the students are weak in English language. Although the studies show the positive effects of concept map on meaningful learning as an influential technique, effective steps have not been taken to apply this technique in official classes of teaching-learning. This study is an attempt to investigate the effect of concept map on English reading comprehension meaningful learning of students (as L2).

Concept map as a teaching strategy

Various methods have been proposed for teaching concepts, discovery method of Brunner and meaningful learning of Ausubel are the most recognized methods among them. Brunner emphasizes the studied issue structure and the necessity of active

learning as the basis of real understanding and Ausubel (1968) emphasizes on the teacher's role in learning and believe that knowledge is acquired through accepting information and concepts and the relationship between concepts. According to Ausubel, the most effective factor in learning is the prior knowledge and meaningful learning occurs when the learner links the new information with prior knowledge consciously. Ausubel proposed advance organizer for activating the learner's mind to link the new information with cognitive structure. Novak supported the Ausubel perspective and specified the concept map as a strategy to access prior knowledge and as a tool to comprehend the text (Novak & Gowin, 1984).

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. Concept maps in various ways, creating map by learner, creating map by teacher and students and presenting the map to the learners, can be used in teaching and learning.

One of the common applications of concept map is its use as a tool for presenting educational materials. In this method, materials and key concepts are presented in an organized manner through concept map. Teachers can use concept map in various stages of teaching, i.e. before teaching as an advance organizer, in teaching process for presenting new information and clarifying concepts, after teaching for summarizing and reviewing and also for testing the learners' achievements. Concept map helps teachers to specify the key concept of the content and their mutual relationship between them and present a summary and general image of topic to the learners. Concept map not only transfer main information through graphical representation, but also specifies the links, structures or characteristics which are not observable in the text and present them in a summarized form. So, map facilitates the meaning and retaining of information. Well organized maps facilitate meaningful learning

and consequently cause the long life use of knowledge in new situations and make it possible to keep knowledge for a long time (Novak, 1990, Novak and Wandrsee, 1991). The positive effects of concept map learning are: providing a framework of learning subject, specifying the important concepts and the relationship between them, facilitating learning, memorizing and remembering, specifying the important concepts which emphasized by teacher and prepare the learner's mind like advance organizer.

The studies have shown the positive effect of concept map on learning (Novak, 2003, Novak & Cannas, 2006, Horton et al, 1993), on foreign language learning (Marriott and Torres, 2008, Bahar and Danservean, 2001), on searching prior knowledge (Gurltt et al, 2007), on improving English reading comprehension (Dias, 2010, Conbn, 2008, Liu, 2010, Vakilifard & Armand, 2006) and on writing skill (Ojima, 2006, Lee & Cho, 2010).

Those whose first language is not English need techniques for better learning, longer information saving and the stored information in the new situations. Teachers also look for teaching techniques which activate students in the language learning process and increase their success. Among effective factors on language learning, the teaching strategies play an important role in learning. These strategies are a lot, but we just focus on prior knowledge and knowledge structure in improving English reading comprehension of second language of high school students and investigate the effect of concept map as a teaching strategy on English reading comprehension (as L2).

Research Background

In the recent years the concept maps have widely been the research basis in various scientific fields and studies have shown the positive impact of concept maps on meaningful learning (Horton et al, 1993, Novak & Cannas, 2006, Novak, 2010). A few studies have been done on concept maps in second language, especially on reading comprehension. Liu (2010) investigated the effect of creating concept maps with the help of computer on English reading comprehension of English bachelor students in Taiwan in which English was L2. The findings of the study showed that not only concept map strategy improves reading comprehension, but also it improves the application of other reading comprehension strategies. Dias (2010) used concept maps for improving English reading comprehension of bachelor students in which English was their L2. The results of the study showed that concept map is an effective strategy to improve reading comprehension. The students not only learned how to use tools to create Cm, but also increased their independence in application of knowledge organizing methods.

Conlon (2008) in a case study on Scottish students titled "creating content concept map, new technology and new teaching concluded that the students enjoy their lessons with creating concept maps and believe in the effectiveness of concept map use in reading comprehension. Armand & Vahidifard (2006) studied the effect of concept map on French (as L2) reading comprehension. The findings of this study showed that the experimental group did better in reading comprehension in comparison to control group. Another study by Lee and Cho was conducted to investigate the application of group concept map on writing skill of Korean university students. The results suggested that the concept map improves the students writing skill incredibly in general and improves organizing, language usage and vocabulary in particular.

Ojima (2006) in a case study investigated the effect of concept map as a pre-task on three Japanese students writing skill. The findings showed that concept map creating improves learners' English writing skill on the basis of complexity. English was L2 in this study. Most of the studies on concept map have been conducted by academic researchers and have been their academic projects. These projects were dealing with a lot of conflicts because concept maps were used in official classes by teachers.

Research Objectives and Hypotheses

This study aimed at investigating the effect of teaching through concept map on English improvement and reading comprehension meaningful learning of EFL students. The research hypotheses are as the following:

H1: Using concept map in teaching improves students' English learning.

H2: Using concept map strategy in teaching leads to meaningful learning of Students' English reading comprehension.

Project Plan

This is a quasi experimental plan of post test with control group. The educational concept mapping strategy (independent variable) and meaningful learning and improvement (dependent variable) were considered as two variables of the study. They were tested by a teacher achievement test. Experimental group was thought through concept mapping, but control group was not exposed to teaching through concept mapping and the common reading comprehension techniques were used in class. To control the external influential factors affecting the subjects, the students in experimental group were under the same conditions such as grade, field, previous school year average, gender, age, school of studying and teacher.

Sample of the Study

Thirty eight female third grade high school students in Karaj city studying in the school year of 2010-2011 were selected through purposive sampling and were divided into experimental and control group randomly. The purposive sampling was used because of the official limitations and preventing the problems that it may make for official educational plan.

Study Tools

1. Materials

English book 3 was used as teaching material in this study. This book is a reading base book and 65 percent of the book content is allocated to reading comprehension and vocabulary. The book contains six lessons and every lesson consists of a reading text of about 6-7 paragraphs, vocabulary, language function, grammar and pronunciation. This study focused on reading comprehension and teaching it through concept mapping.

2. Concept maps

A concept was made by the researcher with the help of Cm tools for every lesson. The maps were verified by a linguist and four expert of English teacher group. The maps were hierarchal type in which most general issues were on apex and detailed and special ones at the bottom of the pyramid. These maps used as teaching tools in experimental group.

Testing tools

An achievement test teacher-made test was used to measure the achievement and meaningful learning. The test questions were made on the basis of Bloom (1956) cognitive categorizing at the level knowledge, understanding, application, analysis, combining and evaluation. The questions were multiple choice, short answer, supplying, explanatory and concept map. Concept map and levels (analysis, combining, and evaluation) questions were used to measure the meaningful learning. To make the academic achievement test, the following steps were taken:

1. Preparation the educational objective of each lesson
2. Preparation of table of content of the book

In this stage content portion of each section (reading,

vocabulary, language function, grammar, and pronunciation) was specified on the basis of allocated time and volume in the book and each section portion was also determined in the test.

3. Two dimensional table of specification of objective and content

The table included two dimensions of objective and content which in each table row the lesson sections and the Bloom's cognitive classified levels were in columns and in each cell there was the section percentage of total score. To be sure of content validity of achievement test, the test items were made on the basis of table of objective-content and after making the test, the achievement test was verified and confirmed by five experts of English teaching group. The test reliability was calculated with Kuder-Richardson which was 0.193, that indicates a good reliability of test.

4. Evaluation Questions

For evaluation, the test questions were reviewed and the necessary changes have been made. Also, in the beginning, the test was administered to two classes (40 students), item difficulty was calculated and weaknesses were reformed.

Methodology

The implementation of this study was done in three stages as the following:

1. Preparation: in this stage the activities like teacher training, lesson plan, concept map creating, achievement test making, and sample selecting were accomplished.
2. Pre-test: a teacher made test was administered to the selected subjects to be sure of their homogeneity
3. Procedure:

Concept map group

English reading comprehension was thought through concept map technique in 12 sessions, each session 60 minutes. In the first session the students became familiar with concept map, concept map characteristics, how to make concept map and some concept map samples. In the following sessions the teaching process were shown in the following table:

Stage	time	activities
Text reading	15	Reading the text by teachers and some of the students in the class, all the students pay attention to the text, the teacher explains difficult words
Focus questions	5	Teacher asks questions from the students about main topic, specifies main idea in one or two words, the teacher writes the ideas on the board and selects the best one as topic
Highlighting text concepts	15	Teacher asks students to specify the main concepts of the text and writes them on the board
Map creating	10	Teacher creates the concept map through specifying the relationship between concepts and main idea
Reviewing	5	Summarizing and reviewing the lesson based on the map by teacher and map revising
Concept mapping	5	Asking students to create the map in their notebooks

In the next session the teacher asks students to create the map on the board for evaluation.

Control group

The control group was exposed to the same lesson, but teaching techniques were different, i.e. the teacher used common techniques (reading the text and explaining it).

Evaluation stage

After teaching the entire book, the students of two groups participated in the final exam for measuring their achievement, their meaningful learning and reading comprehension of the book texts, the allocated time was 90 minutes.

Findings

To analyze the data and verify or reject the hypotheses, the mean, standard deviation, and independent t-test were used. Regarding the first hypothesis of the present study “using concept map in teaching improves students’ English learning”, the result of t-test for comparing two groups were shown in Table 1. Due to the fact that significance level of table (0.002) is less than $\alpha=0.5$ ($p<0.05$), the research hypothesis, i.e. the effect of concept map on English learning improvement is verified. Since the mean of experimental group which was affected by independent variable was 13.96 and it was 10.95 for control group which was not affected by this variable, the mean difference can be referred to the independent variable.

Table 1- the results of independent t-test for comparison of control and experimental groups

Group	N	Mean	SD	T	df	Significance
Experimental	18	13.96	3.28	3.388	38	0.002
Control	18	10.95	2.12			

The results of t-test shown in table 2 were used to verify or reject the second hypothesis and compare experimental and control group, i.e. “using concept map strategy in teaching improves students’ English reading comprehension. According to the results, the significance level (0.0001) is less than α , ($p < 0.05$), so the second hypothesis is verified, that is, the concept map has positive effect on English reading comprehension and meaningful learning. Since the mean of experimental group that affected by independent variable was 13.53 and mean of control group which was not affected by this variable was 8.17, this mean the difference can be referred to the effect of independent variable.

Table 2-the results of independent t-test for comparing the control and experimental groups in meaningful learning and reading comprehension

Group	N	Mean	SD	T	df	Significance
Experimental	18	13.53	4.39	4.426	38	0.001
Control	18	8.17	2			

Results and Discussion

The present study aimed at the investigating the effect of teaching through concept map on English reading comprehension and meaningful learning of the students. The findings showed that using concept map as a teaching strategy has a positive effect on meaningful learning improvement and English reading comprehension of students. The students in experimental group which were exposed to concept map strategy in class did better in the post test than the students in control group that deprived from such kind of instruction. These results are in accordance with findings of Horton et al (1993), Dias (2010), Conlon (2010), Vahdanifard and Armand (2006), Ojima (2006) and Lee and Cho (2010).

Teaching through concept map has positive effect on meaningful learning and reading comprehension for various reasons. First of all, the questions by teacher in class to specify main topic and general and detailed concepts, activate students in the process of learning. Also, the learners use reading strategies like listening, focusing, highlighting, classification and revising effectively. Using of strategies and activating the learner improve learning and reading comprehension. Secondly, creating a map by teacher provides a general idea of the text, key words, concepts sequence and the relationships between different parts of the text in the summarized form and this pictorial summary causes text reviewing, reciting and retaining of information. Thirdly, concept map works as a language and cognitive tool, as a language tool emphasizes on meaning relation of concepts and the way which relations between concepts improve meaning clarification and reading comprehension and possibility of language use. In addition, the connection between the already learned concepts and their usage in the map facilitates the meaningful learning because maps activate prior knowledge. As a cognitive tool, presents the concept map, main topic, important concepts and their relations with each other in a pictorial, summarized and organized form.

The effectiveness of concept map is in accordance with most of the learning theories. According to the meaningful learning theory of Ausubel, concept map plays the role of an advance organizer. The advance organizer presented by teacher activates the mind of the students through connecting the prior knowledge to new information. Teacher show a pictorial summary of the topic and the relationship between concepts in a hierarchical form from the most general to detailed through concept map. This organizing, hierarchical structure and connection of prior knowledge to the new information facilitate meaningful learning because it is the same as the knowledge structure in the mind. Presenting the

concept map in the class as a cognitive tool causes reviewing and organizing of materials and on the basis of information processing theory, the reviewing, expanding and organizing not only causes information transfer, but also improves the mind status. The studies (Lee and Nelson, 2005, Roth and Roychoudhury, 1993) and theoretical principles find concept map as an effective technique in which the visual reviewing of materials is provided easily and the map shows a comprehensive pictorial summary of concepts and their relations. On the basis of dual coding theory Pavia (1991), the information is decoded in the form of pictorial and verbal in the mind and when the information about a topic is decoded in these two ways, the mind processes are improved. Another advantage of concept map is that the pictorial summary of material prevents overload of information in the mind. To sum up, the present study showed the effect of concept maps on meaningful learning of English language, improving reading comprehension and activating the learner in the learning process. On the basis of the findings of this study, it's recommended that the students improve the English, especially reading comprehension through using concept maps and teachers also used concept map as a teaching strategy to help students to improve their reading comprehension.

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