The Effects of Concept Mapping and Critical Thinking Test Strategies on EFL Iranian Learners' Reading Comprehension

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ABSTRACT

This research was designed to investigate the effects of critical thinking and concept mapping test strategies on EFL Iranian learners' reading comprehension in five sessions during near two months. Fifty eight male and female students took a pre-test as a language proficiency test first, then they were randomly assigned to two experimental groups and a control group, twenty students for critical thinking group, nineteen students for concept mapping group and nineteen students for control group were selected randomly. During four sessions of the treatment, each experimental group worked on four reading passages taken from different journals. The participants in two experimental groups were encouraged to think critically and notice meaningfully to the arrows showing how concepts are linked in reading passages. Thinking critically included evaluation, analysis, and synthesis and reasoning for critical thinking test strategy, and finding interrelated concept connections by mapping meaningful graphs for concept mapping test strategy. Along with the experimental groups, the participants in the control group also worked on the same four reading passages, but they were taught scanning, skimming, previewing, predicting, and guessing meaning from the context in order to improve their reading comprehension skills. At the end of four sections of treatment, three post tests were performed in one session. Finally One-way ANOVA was used to analyze the results of the control and the two experimental groups' post- tests, and a significant difference was observed in the two critical thinking group and control group, but there was not observed any significant difference between the concept mapping group and control group.

Key Words: Critical thinking, concept mapping, reading comprehension, language proficiency, pre and post-test.

1. Introduction

Reading comprehension is a complex domain that is involved many processing. The purpose of reading is understanding. Paynter (2000) believes that one of the most fundamental aspects of comprehension is the ability to comprehend the meaning and purposes encountered in texts. Researchers who struggle with meaning level tasks use valuable cognitive spaces that could be allocated to deeper levels of texts knowledge. It is not enough to relay on contexts cues and signals to predict and guess the meaning and purposes of texts, since this strategy often results in superficial understandings of texts, specially in content-area reading, therefore readers can not relay on the contexts signals to infer the consequences of the texts. Researchers have studied to aim remedial reading comprehension strategies in different areas, specially in terms of tests methods (Paynter, Bordrava &Doty,2000).

Over the past decades, there has been a huge shift within the field of language learning and teaching to a focus on learners and their assessment method on other areas such as reading comprehension. In respect to; how learners process their knowledge of reading, and what kind of strategies they apply to comprehend the messages and points, and infer the results of texts have been the main concern of many of the researchers who study in the field of EFL learning. There have been many test methods in order to achieve the valuable and skillful reading

comprehension of readers. Many researchers have examined many test methods on different-levels readers. They found that an efficient and valuable test is able to extract knowledge and background information of readers. One of the key methods that is effective on reading comprehension is adequate and efficient tests uses. Tests increasingly have an significant role on reading comprehension. Adequate and proper tests enable EFL learners to extract their new information and background knowledge.

The major problem of EFL learners with reading comprehension is; misunderstanding and miscalculating. It means, they don't know how to analyze and identify the valuable points and messages, how to infer the acceptable results, and they also unable to comprehend the relations between messages and concepts of texts properly. The lack of strong reading comprehension skills affects learners' success in learning EN language seriously. An academic improvement in reading comprehension depends on understanding, analyzing, and applying the knowledge gathered through reading process. Thus, how we can extract the knowledge is a central problem ,that is, the kinds of test method obviously are effective on reading comprehension of EFL learners. In spite of that, unfortunately there is a limited proper training of strategies in which learners able to comprehend texts and also teachers don't train cognitive strategies in order to make learners able to learn new and cognitive ways completely.

This research attempts to identify different strategies of tests which are applied on reading comprehension of EFL learners. The main concern the present study is examining the concept mapping and critical thinking strategies. The results of the study are intended to create beneficial information for students by encouraging them to read and notice to valuable tests on texts and also to arise their awareness of the importance of being more thoughtful and more careful on links and relations in texts. The main purpose of the present study is training the concept mapping and critical thinking strategies and designing test strategies (concept mapping and critical thinking) in order to identify the better test method and better training strategy for promoting and improving learners' reading comprehension, specially, in journalistic texts. The present study would also aim to provide a suitable environment and facilities in order to remove affective factors during the tests and to provoke the learners thinking and links intelligence in order to acquire the helpful and desirable results.

1.1 Research Questions

The current research will be an attempt to answer the following questions:

1) Is the critical thinking test strategy effective on reading comprehension of EFL Iranian learners?

2) Does the concept mapping test strategy affect on reading comprehension of EFL Iranian learners?

3) What are the effects of training the concept mapping and critical thinking strategies on EFL Iranian learners' reading comprehension?

1.2 Research Hypotheses

In order to fulfill the present research the following hypothesis have been proposed:

1) Critical thinking test strategy is effective on reading comprehension if helpful instruction using.

2) Concept mapping test strategy is also effective on reading comprehension in a condition that necessary instruction applying.

3) The effects of instruction of concept mapping and critical thinking strategies are significant on reading comprehension.

2. Review of Literature

Reading comprehension is highly complicated process. It is necessary that the process of reading comprehension and role of various factors affecting the product and result of this process be appropriately understood (Reed, 1996).Two factors affecting reading comprehension are internal and external factors. Internal factors are defined as everything related to the reader such as readers, background knowledge, cognitive abilities, and affective features. Internal factors are also called as reader variable. External factors are defined as all factors external to the reader. They are also referred to as text variable, context variable and writer variable (Day, 2005). All situational factors such as reading time, the place of reading as well as socio-economic context are under the category of context variable. Writer variable refers to the producer of the text. There is almost a consensus among the researchers that the reader plays an increasingly crucial role in the process of or acts of reading (Chastain, 1988). Researchers have studied on reading comprehension at different fields in recent years. One of their focuses has been on a number of reading comprehension test strategies. There are several test methods for improving reading comprehension. Many authors have suggested a variety of reading comprehension test methods that most of them were beneficial for EFL learners. In this study we focus on concept mapping and critical thinking test skills, because the methods work on memory working and provoke learners to think clearly and rationally.

2.1 What is concept mapping?

The Hierarchical Network Model (concept mapping) assumes that the category information is stored directly in memory by means of associations. Words in the network are stored with arrows showing how they are linked. But the idea of organizing knowledge is nicely captured by an old theory called “Schema Theory” (Collins and Quillian,1970). Thorndyke (1997) describes a schema as a cluster of knowledge that represents a general procedure, object, percept, event, sequence of events, or social situation. The assumption is that we encode such knowledge clusters into memory and use them to comprehend and store our experiences. The idea of “clustering knowledge” clearly shows that knowledge is neither stored nor recalled haphazardly.

2.2 Studies on concept mapping

More than 200 studies in science education have applied concept mapping in one form or another (Novak, 1997; Novak 1990).Several of these research have investigated the reliability and validity of the technique as a way of representing knowledge in scientific disciplines. Generally, these and other studies suggest that the technique has many of the desirable characteristics that testing and measurement experts look for in new assessment tools. For example Novack,et al., in one study shown that the conceptual frameworks revealed by concept

maps reflect essentially the same structure as that seen in much more time-consuming techniques, such as interviews and picture sorting tasks(1990).In another investigation ,successive concept mapping conducted over the course of a full semester in introductory college biology, revealed a cumulative, step-wise growth in knowledge that one would expect to see if the technique taps into students' expanding conceptual frameworks.

Several research suggest that concept map scores do not significantly correlate with traditional assessments of learning such as multiple choice tests. Novak, Gowin, and Johansen suggested that mapping scores were not significantly related to students' SAT scores. These studies suggest that a concept map taps into a substantially different dimension of learning than conventional classroom assessment techniques. It is likely that many techniques commonly used in college science courses focus widely on rote aspects of learning (1993). On the other hand, Gain and Shaw showed that posttest scores on "Select and Fill-in" maps drawn by graduate students in introductory statistics significantly with final course grades (correlation coefficient, r=0.85; N=15). Novack, et al. reported a substantially weaker relationship among novice astronomy student(r 0.4; N 700). The interpretation from this study is that traditional assessment tools (quizzes, tests, final grades) capture some aspects of conceptual structure, and concept maps capture other aspect (1993).

Ferry et al (1998)have expressed concept mapping as follows: concept mapping is a way of picturing course content that enhances retrieve ability of the information on a test. Maps are useful because they reduce large amounts of information and knowledge. Concept maps are graphical tools for organizing and representing knowledge. They are used to categorize information into a graphic form, create a visual representation of the concepts within the text, the relationships among them and the text structure.

Novak &Canas describe concept mapping picturing. They include concepts enclosed in boxes and relationships between concepts through the use of connecting lines and words linking two concepts (2006(.

Graphical tools transform a linear resemblance and 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 students' working memory. The content within a text becomes conceptually and semantically transparent and therefore it becomes easier for the readers, especially the ones with poor language and reading skills, to understand, retain and retrieve it (Novak, 1990; Novak &Cañas, 2006; O' Donell, Dansereau&Hall;Vekiri, 2006(.

According to O'Dnell, concept mapping technique falls into the broad category of mediating tools (2006). The concept of mediation refers to the fact that our relation with the outside world including the other people is always mediated by signals and artifacts .

Novak (1997) has suggested that a concept map is a two-dimensional, hierarchical nodelink diagram that depicts the structure of knowledge within a scientific discipline as viewed by a student, an instructor or an expert in a field or sub-field. The map is composed of concept labels, each enclosed in a box or oval; a series of labeled linking lines, and an inclusive, general-to-specific organization. By reading the map from top to bottom, an instructor can:

1. Gain insight into the way students view a scientific topic;

2. Examine the valid understandings and misconceptions students hold; and

3. Assess the structural complexity of the relationships students depict.

In addition to these applications in assessment, faculty have also used concept maps to organize their ideas in preparation for instruction, as a graphic organizer during class, and as a way to encourage students to reflect on their own knowledge and to work together and share their understandings in collaborative group settings (Novak.1998).

2.3 What is critical thinking?

Critical thinking has been defined in lots of ways. Very wide definitions include thinking which has a purpose or reflective judgment.The idea of critical thinking has its origins from ancient Greeks. Etymologically, the word "critical" derives from the Greek root "kriticos" which means discerning judgment and "kriterion" which means standard. From these Greek roots, "critical" indicates the development of wise and insightful judgment which is based on standards. The basic idea of critical thinking movement started with the works of Socrates who designed a method of asking meaningful questions in order to call old-established ideas, beliefs and authorities to question (Paul & Elder, 1997). Socrates questioned authorities' ideas and beliefs and established Socratic questioning, a method that emphasized the importance of asking analytic and deep questions and looking for evidence to analyze the ideas and arguments.The aim of critical thinking is to evaluate information and to enable us to make informed decisions. Students who exercise critical thinking not only use real life skills of defining, summarizing, retrieving, analyzing, and synthesizing information (Gomez, 2010), but also try to adequately evaluate relevance and reliability of information that they receive from the changing outside world.

2.4 Studies on critical thinking Strategy

Several researchers have studied the effects of direct teaching of critical thinking skills, the use of argument, the use of Paul's thinkers guides and socratic questioning on developing critical thinking abilities (Bessick, 2008; Reed, 2001) and they came to the conclusion that although direct instruction of critical thinking can promote people critical thinking, further research is required in this area .

The importance of developing critical thinking and its effects have been investigated in many fields such as education, nursing, business, management, and health education to name a few. Bullock, Madden, & Harter (1987) conducted a two-year study about Developmental Reading Course at the University of Cincinnati. Developmental Reading Course includes different components that critical thinking is only one part of it. Bullock, Madden, & Harter found a significant improvement in reading skills and especially critical reading skills of the students who had passed the course compared to the students who had not taken it.

Villaume and Brabham (2002) suggested the need for methodologies that deliberately improve students' skills from basic decoding and fluency to deep comprehension of reading texts. This approach to reading instruction aided students to redirect the path from basic comprehension skills to higher levels of critical reading skills.

Jacob ladder reading comprehension was written as a supplemental curriculum targeted toward the students in the third, fourth, and fifth grades. The program was focusing on scaffolding reading instruction from lower to higher level thinking skills with an attention on

higher level thinking and textual analysis (Stamdaugh, 2007). He studied the impact of this program on students' critical thinking and reading comprehension. In the experimental group, students who received Jacob ladder reading curriculum showed remarkable achievements in critical thinking behaviors and reading comprehension .

Frijters, Dam, and Rijlaarsdam (2008) designed a dialogical approach to teaching and learning critical thinking in the context of domain-specific subject matter. They hypothesized that a dialogic approach to learning and teaching would have a more positive effect on students' critical thinking competence than a non-dialogic approach in terms of generating logical reasoning. At the end of the study they noticed that differences in the instructional design between the control and experimental groups did not affect the learning outcomes of the subject matter. Garside (1996) reported an experimental study with the question of whether group discussions facilitate the development of critical thinking test skills more than traditional test methods of teaching. At the end of the study no significant difference was observed between the two instructional methods in developing critical-thinking skills.

In the field of teaching critical thinking skills, in 2008, Yang conducted a study to find out the effectiveness of teaching critical test skills. The question of the study was if students' critical thinking skills develop after they participate in socratic dialogs that is taught by the teacher. The result of the study was in the favor of the positive effects of teaching critical thinking.

In another study that was done by Lauren A. McGuire (2010), the researcher tried to promote critical thinking skills by the direct instruction of rhetorical analysis. Changes in critical thinking skills were measured by the pre-test and post-tests of the California Thinking Skills Test 2000. Gathered data showed no significant difference between the pre-test and post-test scores on induction, analysis, and evaluation questions of the test. However, there was a slight difference between the pre-test and post-test scores on inference and deduction questions.

Petris (2008) investigated the result of higher order critical thinking questions on reading comprehension. In this study first he modeled lower order critical thinking questions, that is, knowledge, comprehension, and application-based questions, and then he modeled higher order questions for the participants, that is, analysis, synthesis, and evaluation-based questions. Towards the final weeks of the study he noted that participants' involvement with the reading texts increased and they raised higher order questions for the reading materials.

3. Methodology

3.1. Objective of the Study

This study aims at examining the impact of critical thinking and concept mapping as test strategies on EFL Iranian students' reading comprehension in English. Although the effects of critical thinking and concept mapping have been investigated in various domains with different groups of subjects, the paucity of research on the impact of critical thinking and concept mapping test strategies on EFL learners' reading comprehension is evident.

A secondary objective of the present study is to find out if there is an interaction between the particular test taken by students and the usefulness of critical thinking and concept mapping as reading comprehension strategies .

The last objective of the present study is to see whether training of the students shows the impacts of critical thinking and concept map training as reading comprehension strategies or not. That is, it is intended to find out if students who are trained in critical thinking and concept mapping benefit more from the strategies compared with their counterparts who do not train any treatment.

3.2. Participants

Fifty eight male and female inter-mediate students studying in SPEAK UP language school in Qazvin participated in this study. All subjects were with ages between 20 and 30. They received extra credit in their English language course in exchange for their participations.

3.2 Study Materials

1. The reading materials consisted of four different passages selected from different journal sources. The passages were controlled for their difficulty level in terms of vocabulary and grammatical structure. They were selected so that they would easily lend themselves to critical thinking and concept mapping. The texts were interesting and informative since thinking and mapping of boring and repetitive texts would be both difficult and tedious for the students at this special level.

2. Multiple Choice Reading Comprehension Test

3. Critical thinking Reading Comprehension Test

4. Concept Map Reading Comprehension Test

5. Proficiency Test

3.3 Procedure

The study was conducted in 5 sessions in near two months, each session lasted about 40 minutes. The subjects were randomly assigned to three groups; 19 in the control and 39 in the two experimental groups, 20 in critical thinking group and 19 in concept mapping group. During the first two sessions, the procedure for conceptually mapping a text was explained to the subjects in experimental group, and as example, two reading passages were conceptually mapped with the subjects' cooperation. This training on concept mapping constituted the treatment of the study. During the second two sessions, the procedure for critical thinking, a text was trained to the subjects in second experimental group, and as example, two reading passages were critically explained. The reading texts were presented to both experimental groups and control group at last session. They were given about 30 minutes to read the passages carefully. The control group received no training on critical thinking and concept mapping written passages. However, they

were thought scanning and predicting and guessing the messages according to traditional method, and also time was available for students to engage in their own strategies for reviewing the passage. All treatment and control groups were given identical pre-reading instruction. Control group received a multiple choice comprehension test and the other groups took a critical thinking comprehension test and a concept mapping comprehension test. The objective, as mentioned before, was to examine the effectiveness of critical thinking and concept mapping test strategies across different test types.

3.4 Data Analysis

First the results of One-way ANOVA was applied to compare the Nelson proficiency measures for the three groups and the results were recorded. After a treatment course for two experimental groups, post-tests of critical thinking and concept mapping test and multiple-choice test were performed. One-way ANOVA was used to compare the results of the posttests in reading comprehension Multiple-choice test and the Critical Thinking Skills Test and Concept Mapping Test in order to find out whether there were any statistically significant differences between the control and the experimental groups at the study. The gain scores of the post-tests of each group were also calculated to find out if any significant improvements happened inside of each group or not.

4. Results

This study aimed at investigating the probable effects of critical thinking and concept mapping test skills on reading comprehension of EFL Iranian learners. The data collection procedure was carefully performed and the raw data was entered into SPSS (version 19.0) to compute the required statistical analyses in order to deal with the research questions and hypotheses of the study. This chapter describes the detailed statistical analyses conducted throughout the research and answering the research question of the study.

4.1 Descriptive statistics for participants' Proficiency test scores

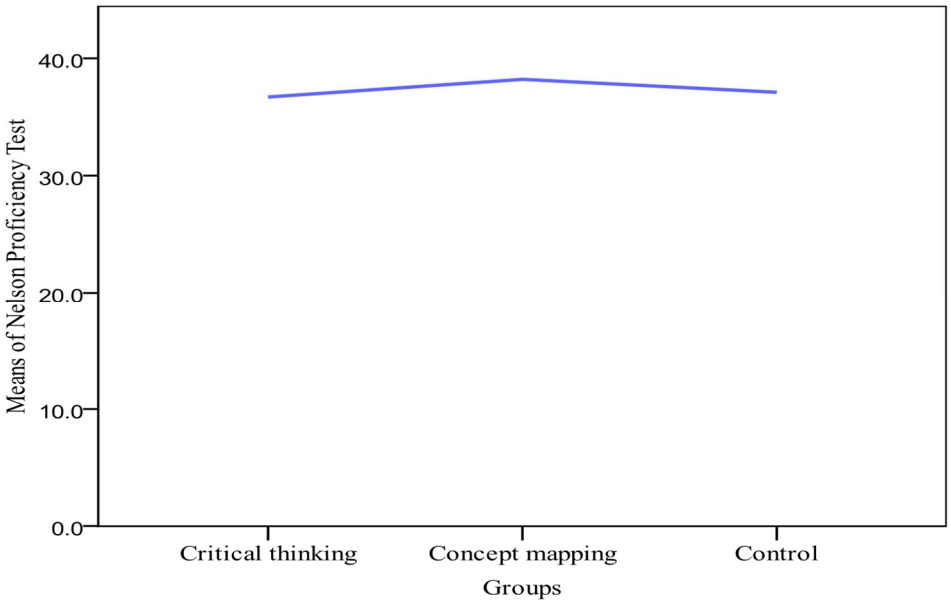
The results of ANOVA that was applied to compare the Nelson proficiency measures for the 58 participants are provided in Table 4.1 below. ANOVA was used as a parametric analysis because the assumptions of using parametric analysis were met. As it can be observed from Table 4.1, ANOVA results indicated that there were no statistically significant differences in proficiency measures among the three groups on the pre-test at the $p < .05$ level, $F_{(2, 55)} = .90$, $p > .05$, in which our F value was lower than the F critical (**4.98**). Consequently we could conclude that the students in the three groups were in the same level of English language proficiency.

Table 4.1

ANOVA for Groups' Reading comprehension Scores (Pre-test)

	Sum of Squares	*df*	Mean Square	*F*	*Sig.*
Between Groups	23.628	2	11.814	.909	.409
Within Groups	715.147	55	13.003		
Total	738.776	57			

In order to display the results more evidently, we draw a Bar Graph (Figure 4.1). As Figure 4.1 illustrates, the mean scores are not far from ach other on Nelson proficiency test**s.**



4.2. Descriptive statistics for participants' reading comprehension scores

The descriptive statistics for participants' reading comprehension scores are given in Table

4.2. As is evident from Table 4.2, the mean of reading comprehension for critical thinking group ($\bar{x}$ = 11.70, SD = 1.65) is the highest, followed by the concept mapping ($\bar{x}$ = 10.95, SD = 1.26), and then the control group ($\bar{x}$ = 9.89, SD = 1.91).

Table 4.2

Descriptive Statistics for Reading comprehension Measures in the Groups

Group	*N*	Mean	*SD*	Skewness	Kurtosis
Critical thinking	20	11.70	1.658	-.083	.307
Concept mapping	19	10.95	1.268	-.439	.432
Control	19	9.89	1.912	.167	-1.078

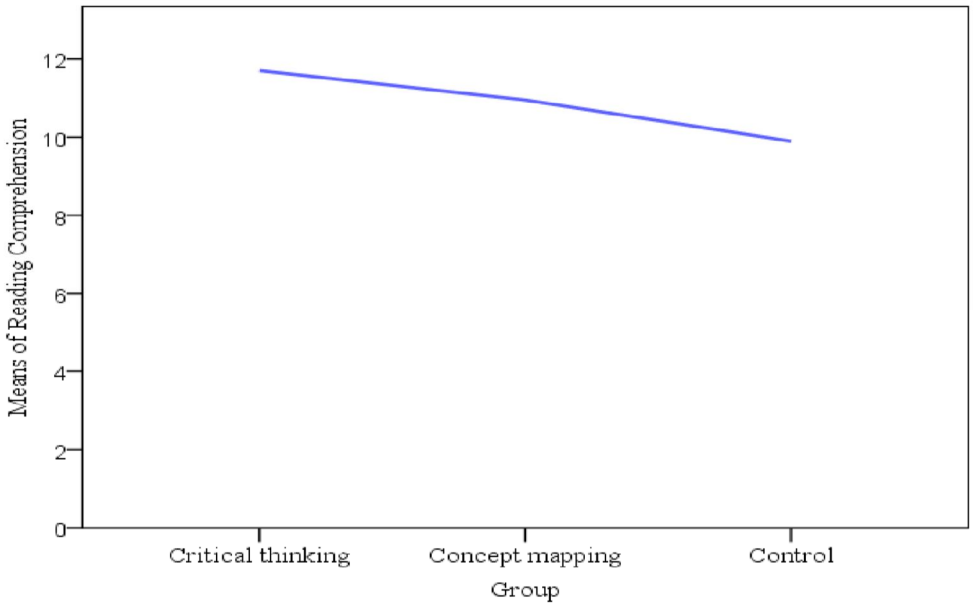
In order to investigate the questions and hypotheses of the study, Post hoc Tukey test results was applied, as appeared in Table 4.2 above, indicated that there was a statistically significant difference in reading comprehension measures for critical thinking group ($\bar{x}$ = 11.70) and control group ($\bar{x}$ = 9.89), p = .003, p< .05. As a result the first hypothesis was confirmed and it was asserted that the critical thinking test improves reading comprehension of EFL Iranian learners, if the suitable instruction is performed.

But, Tukey test (Table 4.2 above) failed to find any statistically significant difference in reading comprehension measures for concept mapping group ($\bar{x}$ = 10.95) and control group ($\bar{x}$ = 9.89), p = .12, p> .05. Accordingly the second hypothesis was rejected and it was claimed that the concept mapping test does not affect reading comprehension of EFL Iranian learners, however the suitable instruction was performed.

Equally, as Table 4.2 above indicates, post hoc test could not find any statistically significant difference in reading comprehension measures for critical thinking group ($\bar{x}$ = 11.70) and concept mapping group ($\bar{x}$ = 10.95), p = .32, p> .05. Thus the third hypothesis was also confirmed only for critical thinking group.

A line chart was made to illustrate the results more obviously (Figure 4.2). As Figure 4.2 shows, the mean reading comprehension scores are greatly different. In fact, the students in the critical thinking group have been the most successful, and the students in the control group the least successful.

In order to display the results more evidently, we draw a Bar Graph (Figure 4.2). As Figure 4.1 illustrates, the critical thinking group is the most successful group.



5. Discussion

According to Benjamin Bloom (1956), in order to develop students' critical thinking skills teachers should work on three higher levels of thinking skills, that is to say, analysis, synthesis, and evaluation. In this research we tried to develop participants' critical thinking skills and investigate its result on their reading comprehension.

Research question number one attempted to answer the question of whether critical thinking tests affect on participants' reading comprehension ability. During the period of the treatment, the participants in the experimental group were encouraged to answer the high level questions for the reading texts that they read and the participants in the control group were thought the techniques of scanning, skimming, previewing, predicting, and guessing meaning from the context to improve their reading comprehension ability. After comparing the results of the post-tests of both groups we came to the conclusion that there was a difference between the experimental group and the control group at the end of the study.

The second research question of this research tried to examine the effects of concept mapping test skills on participants' reading comprehension. By comparing the results of the post- tests, it was found out that there was no statistically significant difference between the experimental group and the control group. But by studying the gain scores of both groups it was learned that although there was no remarkable difference between the gain scores of two groups, there was a slight improvement inside of the concept mapping group. In order to study third question it was found out that if the suitable instruction and environment are presented for participants, the results will be more desirable. At the end, One-way ANOVA was used to answer the research questions of the study.

The study may also support Jonassen's (1996) contention that concept mapping technique forces students to think meaningfully about the content domain in order to identify and verify important concepts, describe the relationship between concepts and assess its meaning.

As a result, critical thinking is an important ability that should be focused on from the very beginning of students' educational life. In this age of information critical thinking is considered important for people, specially educated people, who live in this changing world. According to Akyuz and Samsa (2009), for people and specially students the ability to learn and the ability to make sense of new information are more important than knowing specific knowledge. About the necessity of having critical thinking skills Lau and Chan (2004) argue that critical thinking enhances language and presentation skills. Thinking clearly and systematically can improve the way we express our opinions. They also believe that critical thinking increases creativity and a creative person tries to find new and innovative solutions to old and persisting problems. Regarding to another test strategy, that is, concept mapping we found out that Since the information collected in a map is presented in a network fashion, the subjects familiar with the strategy might have gained a consciousness that by using concept mapping technique and trying to understand the interrelationships between various ideas and concepts presented in a text, they can improve their level of comprehension in long time.

5.1 Conclusion

Zhang (2008) investigated the role of vocabulary in reading comprehension. He believes that vocabulary is the biggest hurdle in reading comprehension. In his study he used the Vocabulary Levels Test to measure students' vocabulary knowledge and then he tested their reading comprehension and their summary writing abilities. The Findings suggested that participants' vocabulary knowledge at the 2000-word and the 3000-word levels was correlated positively to their reading comprehension. Zhang also mentions some other factors that could influence the process of reading comprehension. He suggests that one of the main factors that can affect reading comprehension is the enjoyment of the material. Most people find their comprehension level going down if the material they are reading is boring them. He also names some other factors such as focused attention span, experience, vocabulary level and the ability to make connection that can affect the process of reading comprehension. We have not focused on attention span, experience, vocabulary level. But for the future studies and pedagogical practices maybe it is better we consider these factors as the first steps and after laying the ground we trial other ways of improving reading comprehension.

The findings of this research indicated the fact that increasing participants' critical thinking test strategies in the experimental group through training thinking critically, that is, evaluation, analysis, reasoning and synthesis and made significant difference between the control group and critical thinking group , and also in two control and concept mapping groups by training visualizing and mapping the concepts in experimental concept mapping group there is no significant difference between concept mapping group and the control group . It is necessary to mention the high level

knowledge of vocabulary is really effective on reading comprehension. Reading comprehension is a skill that is influenced by many factors.

This study tried to improve the experimental group's critical thinking strategy through encouraging the participants to make evaluation, synthesis, and analysis questions that we call them higher level question. After using ANOVA to compare the results of the post- tests, we came to the conclusion that there was an significant difference between the control group and the experimental critical thinking group and there was a slight difference between the gain scores of two experimental groups as well. These results showed that encouraging students to think about high level questions and to answer high level questions can improve EFL learners' reading comprehension and also learning concept mapping test can increase a little participants' reading comprehension skills. Maybe there are other influential factors on critical thinking and concept mapping test skills. Reviewing the studies in the second chapter of this research reveals the fact that the majority of the studies that caused significant improvements in participants' critical thinking and concept mapping test skills allocated much more time to their treatment period than this research did and more importantly, the points that were common in the most of those studies that helped the participants increase their critical thinking and concept mapping skills were facing participants with real problems.

With all these sayings, we can conclude that training students with good critical thinking and concept mapping test skills specially critical thinking is a life time process that should be considered from the very beginning of every academic year and in every course both explicitly and implicitly.

5.2 Pedagogical Implications

Before trying to improve students' reading comprehension skills through increasing their critical thinking and concept mapping test strategies, maybe teachers should focus on more preliminary factors that is said to have noticeable influence on reading comprehension. Although we cannot claim that factors such as good knowledge of vocabulary and grammar have the final say, their vital role in reading comprehension cannot be ignored. Apart from the above mentioned factors, factors such as having an interest and motivation in what is read are two elements that should not be forsaken by teachers.

It is not reasonable to expect that students think critically and visualize and find the interrelated concepts meaningfully while they do not have the slightest interest and background knowledge about what they read. Perhaps some interest and background knowledge about the reading text trigger students' critical thinking and concept visualizing more effectively. Therefore, teachers should bear in mind that two factors of background knowledge and interest not only help students have better reading experience, but also help them read more visually , meaningfully ,and critically. As this study illustrated us, we found critical thinking test strategy not only is really helpful in the field of assessment and evaluation of EFL Iranian learners' reading comprehension but also it helps teachers in training of reading comprehension.

5.3 Suggestions for Further Studies

The first limitation of this study was the length of the treatment for three groups, particularly for the two experimental groups. The period of the treatment was near two months. During these two months participants in all groups received four sessions of treatment and they worked on different reading comprehension passages. Maybe this length of time is not long enough to improve participants' critical thinking and concept mapping test skills and consequently their reading comprehension abilities. Future studies can allocate more time to the treatment period and deal with more reading passages. Another limitation of this study was the number of the participants. By increasing the number of participants and the period of treatment, the reliability of the finding can be enhanced. The majority of the participants in this study were men and the factor of gender was not taken into account, so hereafter researches can raise this question; if there is a relationship between gender and critical thinking and concept mapping skills.

As it was mentioned before critical thinking skill has different components and some of them are evaluation, analysis, synthesis, deductive, and inductive reasoning. Future studies can focus on these different components one by one and find out how good men and women can be at these different components.

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Appendix A

Critical Thinking Group's Nelson Proficiency Scores

Score	Frequency	Percent	Valid Percent	Cumulative Percent
30	1	5.0	5.0	5.0
32	2	10.0	10.0	15.0
33	1	5.0	5.0	20.0
34	1	5.0	5.0	25.0
35	3	15.0	15.0	40.0
36	2	10.0	10.0	50.0
37	4	20.0	20.0	70.0
39	1	5.0	5.0	75.0
40	1	5.0	5.0	80.0
42	3	15.0	15.0	95.0
43	1	5.0	5.0	100.0
Total	20	100.0	100.0	

Appendix B

Concept Mapping Group's Nelson Proficiency Scores

Score	Frequency	Percent	Valid Percent	Cumulative Percent
32.0	2	10.5	10.5	10.5
34.0	2	10.5	10.5	21.1
35.0	1	5.3	5.3	26.3
36.0	1	5.3	5.3	31.6
37.0	4	21.1	21.1	52.6
39.0	2	10.5	10.5	63.2
40.0	1	5.3	5.3	68.4
42.0	4	21.1	21.1	89.5
44.0	1	5.3	5.3	94.7
45.0	1	5.3	5.3	100.0
Total	19	100.0	100.0	

Appendix C

Control Group's Nelson Proficiency Scores

Score	Frequency	Percent	Valid Percent	Cumulative Percent
30.0	1	5.3	5.3	5.3
32.0	1	5.3	5.3	10.5
35.0	3	15.8	15.8	26.3
36.0	1	5.3	5.3	31.6
37.0	7	36.8	36.8	68.4
39.0	3	15.8	15.8	84.2
41.0	2	10.5	10.5	94.7
44.0	1	5.3	5.3	100.0
Total	19	100.0	100.0	

Appendix D

Critical Thinking Group's Comprehension Scores

Score	Frequency	Percent	Valid Percent	Cumulative Percent
8	1	5.0	5.0	5.0
10	4	20.0	20.0	25.0
11	3	15.0	15.0	40.0
12	7	35.0	35.0	75.0
13	2	10.0	10.0	85.0
14	2	10.0	10.0	95.0
15	1	5.0	5.0	100.0
Total	20	100.0	100.0	

Appendix E

Concept mapping Group's Comprehension Scores

Score	Frequency	Percent	Valid Percent	Cumulative Percent
8	1	5.3	5.3	5.3
9	1	5.3	5.3	10.5
10	4	21.1	21.1	31.6
11	7	36.8	36.8	68.4
12	4	21.1	21.1	89.5
13	2	10.5	10.5	100.0
Total	19	100.0	100.0	

Appendix F

Control Group's Comprehension Scores

Score	Frequency	Percent	Valid Percent	Cumulative Percent
7	2	10.5	10.5	10.5
8	3	15.8	15.8	26.3
9	4	21.1	21.1	47.4
10	3	15.8	15.8	63.2
11	2	10.5	10.5	73.7
12	3	15.8	15.8	89.5
13	2	10.5	10.5	100.0
Total	19	100.0	100.0	