The Effect of Graphic Organizers on L2 Learners' Reading Comprehension

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Abstract: Many researchers have investigated the effect of using graphic organizers on the reading comprehension of general education students. There is a dearth of research that investigates the use of graphic organizers on the L2 Learners' reading comprehension of English language learners. This case study seeks to extend the literature on graphic organizers by examining their effect on the reading comprehension. An experimental design with a control group was used in the study. 80 Iranian second-grade high school students formed the groups of participants for the study. All of them were female, and their age was in range from 16 to 19. The participants divided into two groups of equal levels based on their Oxford Placement Test (OPT) scores. 40 participants will receive the graphic organizers intervention as Group A and the other participants will receive the traditional reading instruction as Group B. the participants' levels of reading comprehension was tested by means of a reading comprehension pretest. The critical thinking questionnaire was given to the participants of Group A to see whether the participants' critical thinking ability will influence their reading comprehension or not and the posttest was given to the participants in order to examine the extent to which graphic organizers' instruction will affect L2 learners' reading comprehension. After collecting the data, analyses was performed through the Statistical Package for Social Science (SPSS) and ANOVA test was conducted to see whether the results will denote any significant difference between Group A and Group B or not And the result showed that instruction of graphic organizers had a positive effect on the reading comprehension achievement of L2 learners reading comprehension and according to linear regression analysis on the results of the critical thinking questionnaire group A critical thinking ability was not a significant predictor and a significant improvement of the participants reading comprehension ability after a six-week delay was seen as a result of reading instruction with the help of graphic organizers.
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Introduction

Of different recommendations from many researchers regarding facilitating reading comprehension, using graphic organizers has been reported as an effective technique for learners to employ (e.g., Crawford & Carmine, 2000; Ekhmal, 1998; Jiang & Grabe, 2012). Graphic organizers are visual and spatial displays designed to facilitate the teaching and learning of textual materials through the "use of lines, arrows, and a spatial arrangement that describe text content, structure, and key conceptual relationship" (Darch & Eaves, 1986).

The idea of graphic organizers has its roots in Ausubel's theory of meaningful learning (1960) and was originally used as a tool for pre-reading. Based upon the studies of Barron (1969) and Earl (1969), graphic organizers have had an evolutionary development from being initially termed as advanced organizers to an outline model called a structured overview. The application of graphic organizers developed from pre-reading comprehension activities to reading and also post-reading ones (Merkley & Jeffries, 2000). The use of graphic organizers has been justified through three basic reasons. Firstly, they promote L2 learners' comprehension and retention of the materials because they help learner to identify the important concepts of the text. Secondly, because they reduce the load of cognitive information processing on the learner' mind (eliminating the extraneous materials which hinder the learning process), this issue paves the way for teaching the contents involving more complicated concepts. Thirdly, recognizing the procedures for using graphic organizers depicting the organizational patterns and discourse structures -how they are organized and constructed- can help learners to develop new strategies in their reading (Ellis, 2001a).

Applying graphic organizers to many subject areas and age levels, researchers have obtained strong pieces of evidence for the effectiveness of this technique (Dye, 2000). Bean, Singer, Sorter, and Frazee (1986) reported significant improvement in the scores of tenth grade students while receiving detailed instruction on using graphic organizers. As Jiang and Grabe (2012) have noted, although a myriad of studies provide indications of graphic organizers' effect on L1 reading comprehension, these studies are somehow limited in quantifying the size of this effect on L2 reading comprehension. The

present study will investigate the effect of these organizers on L2 reading comprehension.

The accumulated body of research supports this point that among the three parts of long-term memory-procedural, episodic, and semantic-semantic memory is responsible for storing facts and information. In this part of memory, for the new information to stick in the learner's mind, the information has to be linked or applied for retention by the learner (Mercer, 1997). Dye (2000) recommended graphic organizers as ways of assisting L2 learners to link new material to his or her existing prior knowledge. Ausubel (1963) also believed that a learner's existing knowledge-cognitive structure-has great influence on the way he or she will learn later. When the cognitive structure strengthens through links and ties with new information, learning takes place. Providing this rational, he mentioned that graphic organizers are effective tools to create meaningful connections between existing knowledge and the new information. Mayer (1984), confirming what Ausubel said about meaningful learning, stated that considering this point that reading is an information processing and storage process, graphic organizers can be very influential to use during this processes because they display the linkage of the concepts and also connect the learner's existing knowledge base with the text information.

Awareness of how texts are organized, considering different organizational patterns (e.g., cause-effect, comparison-contrast, classification, problem-solution, for and against, procedure and sequence, definition and narrative episodes) is seen as an important factor in promoting L2 learners' comprehension abilities (Pearson & Fielding, 1991; Trabasso & Bouchard, 2002). Mohan (1986) believed that through teaching the formal schemata, which includes the specific practical structures of description, sequence, and choice as well as the general theoretical structures of classification, principles and evaluation, we equip L2 learners with basic information that they can transfer to all types of expository oral and written discourses. He noted that we also enable L2 learners to develop thinking skills and the genre-specific language required for constructing discourse. Therefore, he claimed that graphic organizers open up the possibility for L2 learners to achieve those goals.

Grabe and Gardner (1995) mentioned that the finite number of discourse structures and their recurrence across texts makes it possible to explicitly teach these structures. When L2 learners become knowledgeable about the ways that texts are organized, "they will be able to better understand the coherence and logic of the information being presented, and they will be able to locate the main ideas and distinguish them from the less important information" (Grabe & Gardner, 1995). Koda (2005) claimed that the acquisition of discourse structures occurs only in the environment of formal training and substantial reading. It means that L2 teachers should employ special techniques to raise L2 learners' awareness of these structures. Bearing this point in mind, Jiang and Grabe (2012) suggested that the use of graphic organizers provides the teachers with a very workable technique to instruct these discourse structures in the classroom and to make L2 learners aware of the organizational patterns of the texts.

A strategy is an individual's approach towards a task (Bulgren & Lenz, 1996). According to what Deshler and Lenze (1986) said, strategies include how a person thinks and acts when planning, executing, and evaluating a task and its subsequent outcomes. When L2 learners become familiar with those different organizations of various topics that occur over and over in the texts, their reading and writing, communication, analytical, and their creative skills are subject to improve in the case of using graphic organizers (Ellis, 2001b).

There are many studies (e.g., Chiang, 2005; Jau, 1998; & Kuo, 2003) which have been done in Taiwan to explore the effect of graphic organizers on learners' EFL learning. For example, the Jau's study on the effects of graphic organizers on 103 college learners' vocabulary learning produced significant results. The results reported that the organizer strategy group outperformed the question-answer group in reading comprehension, especially in vocabulary development.

Carrell, Pharis, and Liberto, J. C. (1989) investigated the effect of semantic mapping and experience-text-relationship (ETR) method on the metacognitive strategy training of ESL students. In semantic mapping, as they noted, categories and associations are displayed visually in a diagram. In ETR method the significant issue is comprehension and the method attempts to connect the reader's background knowledge-experience-to the new information in the text. Carrel et al. (1989) claim that "besides being effective for vocabulary development, semantic mapping has proved to be a good alternative to traditional pre-reading and post-reading activities." What the findings of the study indicated was that semantic mapping group and the ETR performed much better than the nonstrategic group. So, the semantic mapping and ETR were highly recommended as influential metacognitive strategies which enhanced second language learning in a considerable way.

This implies that there is a call for a special technique to develop interactive model of teaching reading. Garner (1987) mentioned that the schema

theory activates prior knowledge structure of learners and links new knowledge with the knowledge already stored in their minds. Rumelhart and Ortony (1977) noted that based on the schema theory in reading, both of the processing which mentioned above occur simultaneously in order to achieve reading comprehension. Moreover, according to what Ausubel (1963) said, when cognitive structures or the schemata in the mind become stronger -through the use of graphic organizers- comprehension will be achieved. The implication is that graphic organizers are hoped to be facilitative techniques to cover both bottom-up and top-down processing-interactive model of teaching reading-which are essential in efficient reading comprehension.

As Dye (2000) has mentioned, one of the most pressing tasks facing L2 teachers who teach reading is trying to connect the existing information-background knowledge-in the learner's mind to the new materials. Therefore, L2 learners should have the opportunities to become familiar, through the strategies at their disposal, with the organizational patterns and discourse structures of the texts in order to be able to create cognitive maps in their minds and learn the information meaningfully. Using graphic organizers is one such learning strategy, which has received much attention by both L2 researchers and practitioners (National Reading Panel, 2000).

As a whole, contemporary L2 reading educators are seeking the kinds of reading strategies that could outstrip the traditional views of strategies for teaching reading (Abraham, 2002). It means that there is a vital need for a special kind of strategy that not only promote L2 learners' linguistic knowledge (e.g., grammar and vocabulary) of the texts but also their comprehension and retention of other reading materials.

Methodology

Initially, 100 students were given the grammar section of OPT. Out of this number the top 80 students were chosen for the purpose of the study. These 80 participants were Iranian second-grade high school students. The participants were all female and aged between 16 and 19. Then, the participants were divided into two equal groups of 40 and the homogeneity of the two groups was tested and ensured by comparing the participants' scores on an Oxford Placement Test (OPT). Of these 80 participants, 40 participants will receive the graphic organizers intervention as Group A. The remaining 40 participants will receive a traditional reading instruction (translation-based) as Group B.

The materials used will consist of an OPT test, a pretest, a critical thinking questionnaire (Watson Glazer Critical Thinking Questioner), four kinds of graphic organizers, and a posttest. The OPT test will be given to the participants to determine their homogeneity. The participants will receive a reading comprehension pretest which is comprised of 15 questions adapted from a standard TOEFL test and is used to examine the participants' levels of reading comprehension. The critical thinking questionnaire is given to the participants of Group A to see whether the participants' critical thinking ability will influence their reading comprehension or not. Four kinds of graphic organizers which represent four special concepts -definitions, cause-effect, compare-contrast, and classification - will be instructed to Group A. It means that the teacher will explain the way of using these graphic organizers in the first session and he will continue to teach reading comprehension through theses organizers in the next sessions, too. Meanwhile Group B will be instructed according to the traditional method of teaching reading. The posttest will be given to the participants with a format similar to the pretest in order to examine the extent to which graphic organizers' instruction will affect L2 learners' reading comprehension.

The time allocation for this investigation is one 10-week period. All of the graphic organizers will be teacher-generated. First of all there will be an OPT test which involves all the 80 participants. Then, the pretest will be given on the first day of a 10-week schedule. Next, a critical thinking questionnaire will be given to the participants during the first week. Regarding Group A, reading texts will be instructed through four different kinds of graphic organizers during this 10-week schedule. But, Group B will receive the traditional method -translation-based method- for reading comprehension. The posttest will be given on the last day of the 10-week schedule to both Group A and B.

After collecting the data, analyses will be done through the Statistical Package for Social Science (SPSS). ANOVA test will be conducted to see whether the results will denote any significant difference between Group A and Group B or not.

Results

Test of Homogeneity

The performance of the participants on the OPT was compared across two groups to make sure that the two groups were homogeneous at the beginning of the experiment. The mean score in group A in which the participants were supposed to get exposed to graphic organizers was 66.70 while it was 68.20 in group B in which the participants were supposed to get instructed using traditional approach (Table 1).

Table 1-Descriptive statistics of the students' performance on OPT before the experiment

Test	Group	N	Mean	Std. Deviation	Std. Error Mean
OPT	A	40	66.70	7.050	1.115
	B	40	68.20	7.542	1.192

To ensure that the difference of the two groups mean scores was not significant and the groups were homogeneous before the experiment an independent t-test was computed. There was no significant difference between the two groups in terms of language proficiency and they were homogenous: t (78) = -0.919, p = 0.361 (Table 2).

Table 2-The results of the independent t-test for the participants' performance on OPT in two groups

Test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
OPT	Equal variances assumed	0.135	0.714	-0.919	78	0.361	-1.500	1.632	-4.750	1.750
	Equal variances not assumed			-0.919	77.648	0.361	-1.500	1.632	-4.750	1.705

Pretest performance

The descriptive statistics of the participants' performance on the pretest is represented in table 3 and Figure 1. As the table and the Figure shows the participants in group A and group B performed roughly the same on the pretest ($m_{(group\ A)} = 9.23$ and $m_{(group\ B)} = 9.58$).

Table 3-The results of the descriptive statistics of the participants' performance on the pretest

Test	Group	N	Mean	Std. Deviation	Std. Error Mean
Pretest	A	40	9.23	1.702	0.269
	B	40	9.23	1.279	0.202

Although the difference between two groups was trivial, further comparison of means using independent sample t-test was done (table 4). As the table demonstrates the difference is not statistically significant, t (56) = -1.737, p= 0.088.

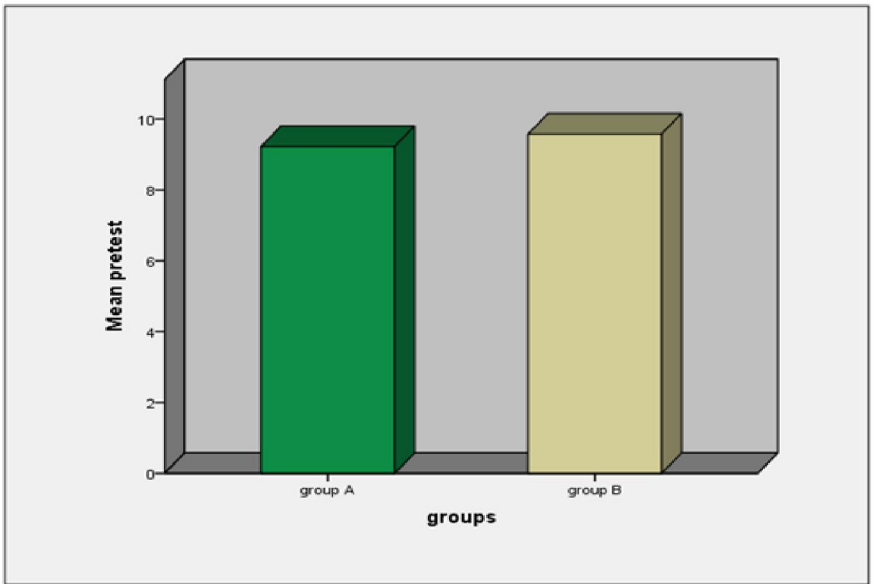

Figure 1- The pretest mean scores across two groups

Table 4-The results of the independent sample t-test for the participants' performance on pretest across two groups

Test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
OPT	Equal variances assumed	4.757	0.032	-1.040	78	0.302	-0.350	0.337	-1.020	0.320
	Equal variances not assumed			-1.040	72.391	0.302	-0.350	0.337	-1.021	0.321

Performance of group A on the pretest and their Watson Glaser Critical Thinking Appraisal

To identify if the critical thinking ability of the participants in group A had an influence on their pretest performance a linear regression analysis was performed (Table 5).

Table 5-The results of the linear regression analysis for group A performance on pretest and their critical thinking ability

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Watson Glazer Critical Thinking Appraisal	B	40	9.23	1.279	0.202

It is found that group A critical thinking ability was not a significant predictor ($\beta = 0.005$, $p = 0.977$).

Performance of group A on the pretest and immediate posttest

To see if using Graphic organizers in teaching reading comprehension to Iranian high school second graders affected their reading comprehension an independent sample t-test was computed to compare the performance of group A participants on the pretest and the immediate posttest. Table 6 shows the mean scores. While participants average score on the pretest was 9.23, their score on the immediate posttest was 13.15.

Table 6-The results of the descriptive statistics of Group A performance on the pretest and immediate posttest

Test	Group	Mean	N	Std. Deviation	Std. Error Mean
Pretest	A	9.23	40	1.702	0.269
Immediate posttest	A	13.15	40	0.949	0.150

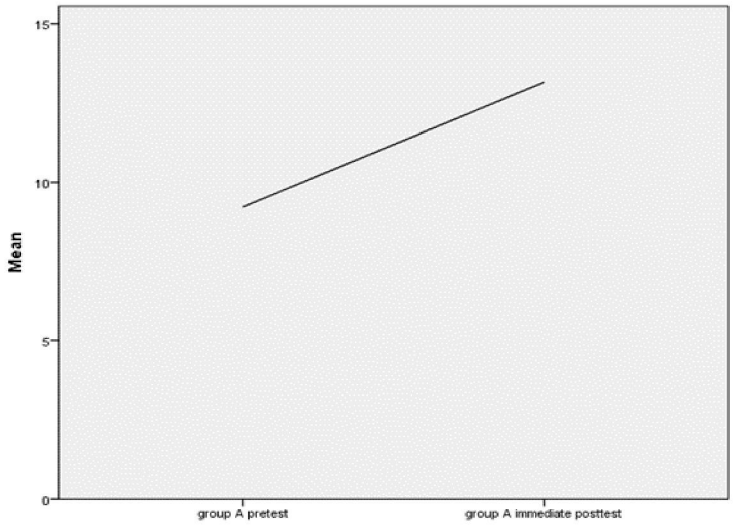

Figure 2- Group A pretest and immediate posttest

The Figure shows that the average score of Group A participants has improved from 9.23 in pretest to 13.15 in immediate posttest as a result of the specific instruction they received during the experiment. To determine if this growth was significant a paired sample t-test was computed (Table 7). It was found that the two scores were significantly difference: t (39) = -12.796, p = 0.000.

Table 7-The results of paired sample t-test for participants' performance on the pretest and immediate posttest

Pair group A	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
pretest - immediate posttest	-3.925	1.940	0.307	-4.545	-3.305	-12.796	39	0.000

Teaching approach and participants' performance on the immediate posttest

This part deals with this question: Is there a significant difference between the reading comprehension scores of Group B (those receiving the traditional method for reading comprehension - translation) and Group A (those receiving the graphic organizers intervention for reading comprehension) on the immediate posttest? First we compare the mean scores of the two groups (Table 8).

Table 8-The results of the descriptive statistics of the participants' performance on the immediate posttest

Test	Group	N	Mean	Std. Deviation	Std. Error Mean
Immediate posttest	A	40	13.15	0.949	0.150
	B	40	11.25	1.410	0.223

The results show that the mean score was higher in Group A ($m_{(Group\ A)}$ = 13.15 and $m_{(Group\ B)}$ = 11.25)

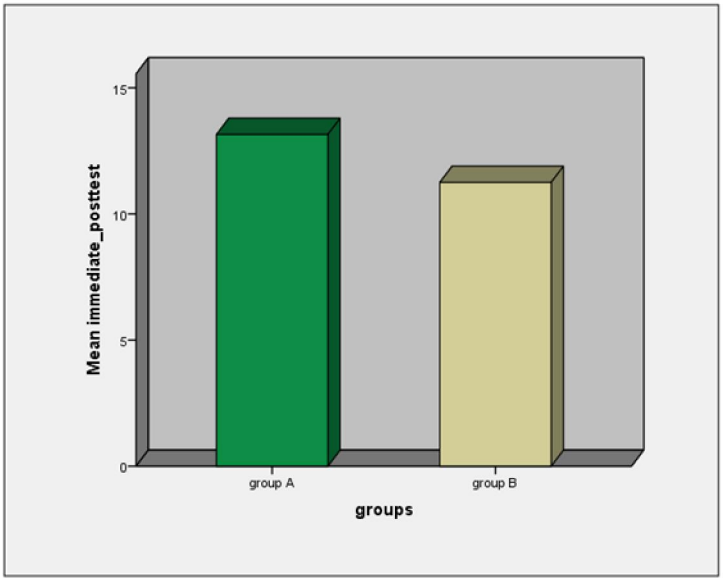

Figure 3- The immediate posttest mean scores across two groups

Figure 3 also depicts the difference between the two groups. To identify whether this superiority was statistically significant an independent sample t-test was computed. The results are shown in table 9. The analysis reveals that there was a significant difference between the group that received traditional instruction (Group B) and the one that was instructed using graphic organizers (Group A) and that teaching technique had a significant influence: t (78) = 7.072, p = 0.000.

Table 9- The results of the independent t-test for the teaching technique and participants' performance on the immediate posttest

Test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Immediate- post test	Equal variances assumed	5.388	0.023	7.072	78	0.000	1.900	0.269	1.365	2.435
	Equal variances not assumed			7.072	68.314	0.000	1.900	0.269	1.364	2.436

Teaching approach and participants' performance on the delayed posttest

The comparison of group A performance on pretest and delayed posttest and the analysis of the participants' performance on the delayed posttest across the two groups provides answers to this question that: Will the instructional effects remain after a 6-week delay? To answer this question initially we compare the performance of group A on the pretest, immediate posttest, and delayed posttest (Table 10).

Table 10- Group A performance on the pretest, immediate posttest, delayed posttest

group A	Pretest	Immediate posttest	Delayed posttest
Mean	9.23	13.15	11.78
N	40	40	40
Std. Deviation	1.702	0.949	1.847

The performance of Group A participants on the delayed posttest was still better than their performance on the pretest, it has weakened compared to their performance on the immediate posttest. Figure 4. Depicts the changes in the reading comprehension ability of group A participants as measured by pretest, immediate posttest, and delayed posttest.

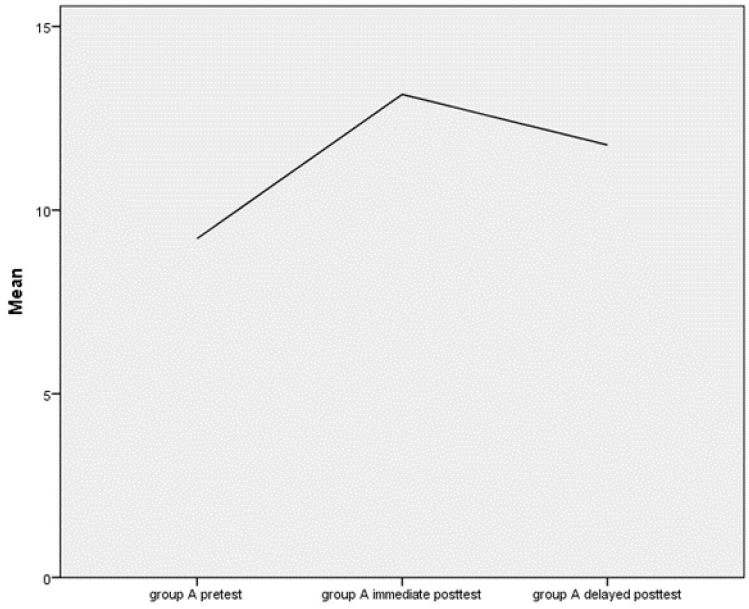

Figure 4- Group A pretest, immediate posttest, and delayed posttest

To identify if the improvement of participant after a six-week delay has still been significant compared with the pretest scores a paired sample t-test was computed (Table 11).

Although the delayed posttest scores has decreased in comparison with the immediate posttest scores, the results show a significant improvement of the participants reading comprehension ability after a six-week delay as a result of reading instruction with the help of graphic organizers: t (39) = -5.797, p = 0.000.

Table 11- The results of paired sample t-test for Group A participants' performance on the pretest and delayed posttest

Pair group A	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
pretest – Delayed posttest	-2.550	2.782	0.440	-3.440	-1.660	-5.797	39	0.000

Then we compare the delayed posttest scores of Group A and Group B to see if graphic organizer-aided teaching is still superior after a six-week delay. At first, let us look at the mean scores of the two groups (Table 12). As can be seen, on average Group A performed better than Group B (delayed posttest mean $_A$> delayed posttest mean $_B$).

Table 12- The results of the descriptive statistics of the participants' performance on the delayed posttest

Test	Group	N	Mean	Std. Deviation	Std. Error Mean
Delayed posttest	A	40	11.78	1.847	0.292
	B	40	9.95	1.663	0.263

Figure 5 demonstrates the superiority of Group A participants vividly.

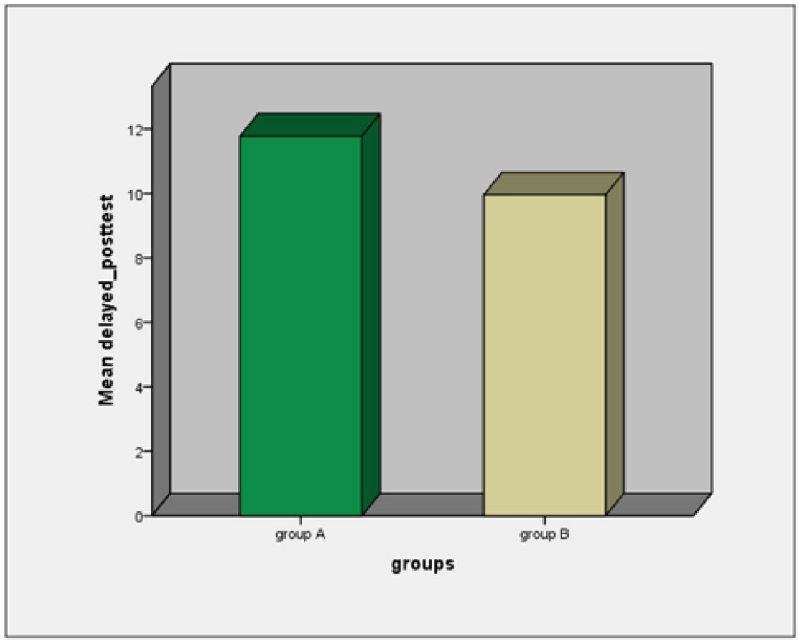

Figure 5- The delayed posttest mean scores across two groups

To examine whether this superiority was statistically significant an independent sample t-test was run (Table 13).

Table 13- The results of the independent t-test for the teaching technique and participants' performance on the delayed posttest

Test		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Delayed-post test	Equal variances assumed	2.005	0.161	4.644	78	0.000	1.825	0.393	1.043	2.607
	Equal variances not assumed			4.644	77.164	0.000	1.825	0.393	1.043	2.607

The results show that there was still a significant difference between the reading comprehension ability of the participants who were instructed using graphic organizers and those who were taught using traditional translation techniques after a six week delay: t (78) = 4.644, p = 0.000.

Discussion

This paper argues that the instruction graphic organizers in L2 learner's reading comprehension may affect the reading comprehension. The lack of empirical research about the use of graphic organizers in reading in another language was the starting point for the study.

In this study the results of the participants' performance on the pretest is reported. Next, the analysis of the effects of critical thinking ability of Group A participants on their pretest performance is reported. In addition, Group A participants' performance on the immediate and delayed posttest is compared with their pretest performance in order to determine if using graphic organizers was effective. And finally, the performance of the participants on the immediate and delayed posttest is compared across the two groups. As Jiang and Grabe (2007) emphasized the need for a long time period instruction period for the use of graphic organizers, the experimental procedure was planned for 10 weeks, and the results showed that participants' performance on the pretest is represented and in group A and group B performed roughly the same on the pretest and According to independent sample t-test the difference is not statistically significant and according to linear regression analysis on the results of the critical thinking questionnaire group A critical thinking ability was not a significant predictor, To compare the performance of group A participants on the pretest and the immediate posttest an independent sample t-test was computed and the result showed that the average score of Group A participants has improved from 9.23 in pretest to 13.15 in immediate posttest as a result of the specific instruction they received during the experiment.

According to descriptive statistics of the participants' performance on the immediate posttest the mean score was higher in Group A ($m_{(Group\ A)}$ = 13.15 and $m_{(Group\ B)}$ = 11.25) and showed that there is a significant difference between the reading comprehension scores of Group B (those receiving the traditional method for reading comprehension - translation) and Group A (those receiving the graphic organizers intervention for reading comprehension) on the immediate posttest and the independent sample t-test Confirmed the results. To answer the question (Will the instructional effects remain after a 6-week delay?) initially we compare the performance of group A on the pretest, immediate posttest, and delayed posttest and the results showed that the performance of Group A participants on the delayed posttest was still better than their performance on the pretest, it has weakened compared to their performance on the immediate posttest. According the results of a paired sample t-test although the delayed posttest scores has decreased in comparison with the immediate posttest scores, the results show a significant improvement of the participants reading comprehension ability after a six-week delay as a result of reading instruction with the help of graphic organizers. Based on the obtained results of the delayed posttest scores of Group A and Group B, average Group A performance was promoted than Group B (delayed posttest mean A> delayed posttest mean B) and independent sample t-test confirmed this result.

Conclusion

It can be concluded that the instruction of graphic organizers had a positive effect on the reading comprehension achievement of English language learners. The findings of the research are consistent with the findings of Carrell (1985) who found that the instruction of graphic organizers facilitated reading comprehension in ESL context.

Robinson et al. (2003) who studied on increasing text comprehension reported that instruction of graphic organizers helped note taking in courses. Their study, however, did not test reading achievement. The findings were limited with the help of graphic organizers in teaching course content. Therefore, the findings of this study revealed that the instruction of graphic organizers had positive effects of reading comprehension of English language learners.

Almost all of the participants in the experimental group expressed they had more confidence while reading in English. These observations are similar with the findings of Mede (2010) and Carrell (1985). Some of the participants also said that they started to read better in L1, too. Therefore, it can be assumed that instruction of graphic organizers helps reading not only in a foreign language but also in native language. This may resulted from the fact that graphic organizers will improve text comprehension and meta-cognitive skills of learners (Robinson et al, 2003). Another important observation was that the participants in the experimental group came up with different graphic organizer shapes during the treatment. They were also very willing to share their graphic organizer with their classmates. The instruction of graphic organizers encouraged the students to study cooperatively. Most of them reported that their exam scores started to be better than before.

Recommendations

The research into the effectiveness of graphic organizers as a reading comprehension intervention has been mainly focused on the population of students who are not native speakers of English in Iran. Although the results of this study add to the research literature, the generalizability is limited based on the small number of participants.

Further research is needed that examines the effects of graphic organizers on the reading comprehension of L2 learners', over an extended intervention period. Based on the findings in this case study, graphic organizers appear to be an effective reading comprehension intervention for L2 learners' in a public middle school in Iran. Continued research is warranted in investigating methods for teaching students to use graphic organizers effectively during the middle school years when reading to learn becomes a crucial step for their educational success.

In addition, further research could investigate the instructional procedures on graphic organizers used in this study with elementary school students to determine if it can aid in preparing them for reading to learn.

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