The Effects of Using Mind-mapping via MALL in Competitive and Cooperative Modes on L2 Reading Comprehension

Rezan Rostami
MA, Department of Teaching English, Sanandaj branch, Islamic Azad University, Sanandaj, Iran.
rostamirezan74@gmail.com

Abstract- One of the ways through which teachers can help learners to improve their reading comprehension is mind mapping. The purpose of this study was to examine the effect of MALL-mediated mind mapping on the reading comprehension of EFL learners in competitive and cooperative modes. Participants included 87 learners selected out of 140 learners based on their scores on Preliminary English Test (PET). The results of the reading comprehension section of PET were considered as a pretest. Then, the selected participants were divided into two experimental groups each consisting of 28 learners and a control group containing 31 learners. Then, the researcher administered mind mapping via Telegram in group one in a cooperative mode while mind mapping was done via Telegram in a competitive mode in the second group. As for the third group, the conventional syllabus of the language school was followed. At the end of the treatment, the researcher gave the participants the reading comprehension posttest. The results of statistical analyses indicated that both MALL-mediated mind mapping interventions were effective on reading comprehension in both competitive and cooperative modes. Moreover, there was a significant difference between MALL-mediated mind mapping in the cooperative and competitive modes on EFL learners' reading comprehension with the cooperative mode being more effective than the competitive mode.

Keywords- Reading comprehension, mind map, MALL, competition mode, cooperation mode.

1. Introduction

Undoubtedly, reading comprehension is regarded as a salient skill in the context of English as a Foreign language (EFL) because reading is considered the main channel of input (Hwang & Duke, 2020). In a literate society, reading comprehension ability is one of the language skills that determine the success of language learning activities (Brevik, 2019). However, EFL learners usually struggle with reading comprehension as this skill is complicated in nature. Elleman and Oslund (2019), highlighting the complexities involved in the reading comprehension process, maintain that reading comprehension (understanding, gaining meaning, and interpreting the text) depends on a variety of reader-related, text-related, and situational factors. To be able to read effectively and to receive a better comprehension of a text in reading classes, the students should have sufficient knowledge of what to read and how to organize the language to understand a text (Kusmaningrum, 2016).

One of the ways through which teachers can help learners to improve their reading comprehension is mind mapping. Kusmaningrum (2016) mentions mind mapping as one of the effective strategies which have been used for understanding written text. To improve reading comprehension, mind mapping, as a visual tool, can be used to generate new ideas, take notes, organize ways of thinking, and develop concepts (Kusmaningrum, 2016). Another factor contributing to reading comprehension is the mode of learning. To address the cooperative mode of learning, the results of a study conducted by Ghaith (2003) revealed that cooperation produced higher achievement than competitive or individualistic attempts. Despite using strategies to improve reading, it seems that there is a problem concerning how reading comprehension should be dealt with in the classroom in various learning environments (Elleman & Oslund, 2019). As García Botero, Questier, and Zhu (2019) contend, different learning environments can affect learning outcomes differently. Likewise, Gutiérrez-Colón, Frumuselu, and Curell (2020) note that Mobile Assisted Language Learning (MALL) can impact learning outcomes differently as MALL has its unique characteristics compared to conventional teaching environments. Although previous research has indicated the usefulness of mind mapping (e.g., Kusmaningrum, 2016) and cooperative learning (e.g., Marzban & Alinejad, 2014), and MALL (Keezhatta & Omar, 2019) on reading comprehension separately, the area of investigating the effects of mind mapping in cooperative and competitive modes in MALL environments on reading comprehension is quite under-explored which is referred to as the empirical

gap of the study and will be the focus of the present investigation.

2. Methodology

2.1 Participants

The initial participants of the study were 140 female foreign language learners at the intermediate level of language proficiency studying English at a language institute in Kurdistan province, Iran. The participants were all female and mostly university students within the age range of 18 to 30. They were selected based on the convenience sampling method. These 140 participants were given a Preliminary English Test (PET) the results of which were used to select 87 targeted intermediate learners whose scores were within the range of +/- one standard deviation from the mean.

2.2 Instruments

2.2.1 Preliminary English Test (PET)

PET was used to assure the selection of homogeneous participants in terms of overall language proficiency. This test is suitable for the intermediate level. It consists of 4 parts and measures all 4 skills (speaking, writing, reading, and listening) during 2 hours. The reading section consists of 35 questions including multiple-choice, matching, and true-false items. In the first part of the writing section, the participants are expected to complete some incomplete sentences. In the second writing task, the participants are presented with some kind of information in the form of a postcard, note, or email. They are supposed to write a paragraph of about 35 words. They are presented with two different topics; therefore, they can choose one of them and write about it in 100 words. Scores will be obtained through the writing rating scale of PET. The listening part has 4 sections consisting of 25 multiple-choice questions which were held for 30 minutes. Learners are supposed to listen to some short recordings and for each recording circle the best alternative provided. In the speaking part, there is an interview which lasts around 10 minutes, candidates are required to take part in conversations, asking and answering questions and talking freely about their likes and dislikes. Their scores were calculated through a PET speaking rating scale. The final mark a candidate receives is the total of the marks obtained in each of the parts. The reading and writing parts carry 50% of the total mark and the listening and speaking each carry 25% of the total mark. It should be noted that the reliability of the PET was calculated by running Cronbach's Alpha. The reliability of the PET turned out to be .743 which is considered satisfactory (Hulin, Netemeyer, & Cudeck, 2001).

2.2.2 Reading Comprehension Pretest and Posttest

The scores of the reading comprehension of PET administered for homogeneity purposes were used as the reading comprehension pretest scores. As for the reading posttest, the reading comprehension of PET from another version was used. The reliability of the PET reading pretest and posttest were calculated by running Cronbach's Alpha. The reliability indices for the reading pretest and posttest were .710 and .821 which are considered acceptable (Hulin, Netemeyer, & Cudeck, 2001).

2.3 Data Collection Procedure

Initially, PET was administered to 140 female EFL learners. Among them, 87 students whose scores were within the range of +/-one standard deviation from the mean were selected. Then, the selected participants were divided into two experimental groups each consisting of 28 learners, and a control group consisting of 31 learners. Following that, the three groups were given the reading pretest. Having assured the homogeneity of the participants in terms of overall language proficiency as well as reading comprehension, the researcher instructed the learners to use mind mapping via Telegram in group one in a cooperative mode. In the second experimental group, mind mapping was done via Telegram in a competitive mode. As for the third group, the conventional syllabus of the language school was followed. The conventional syllabus of the institute was the Touch Stone series in which the four skills of speaking, reading, writing, and listening are worked on along with the three components of the language including grammar, vocabulary, and pronunciation. However, for the treatment of this study, PET reading materials were worked on as supplementary materials in all groups including the experimental and control groups. Therefore, in the three groups, the participants worked on the same reading materials and reading activities. Examples of texts were Paris Hotels, Music for Life, a healthy mind, and Different Sides of Egypt. More specifically, in all three groups, the participants worked on the same reading materials and reading activities. The difference, however; was the matter of two different modes in developing the mind map strategy used as reading activities in this study. To this aim, in a cooperative learning setting, the participants were asked to use the mind map strategy in pairs. Overall, in the cooperative group, learners were asked to

create mind maps with helping each other. Plus, learners were encouraged to help each other to have a satisfactory outcome. The participants of the second group were asked to create their mind maps competitively. To do so, the researcher emphasized that learners had to create their mind maps individually and they were not allowed to seek help from one another. Moreover, to create a competitive atmosphere, the researcher informed the learners that the five best mind maps would have 10 bonus points which would be added to their final exam scores. At the end of the treatment, the researcher gave the participants in three groups the reading comprehension of PET from another version as a posttest and the results of which were used to investigate the research questions.

2.4 Design of the Study

The present study used a quasi-experimental design since pure randomization was not feasible for the researcher. Mind mapping via MALL in cooperative mode and competitive mode were the independent variables. Reading comprehension was the dependent variable.

2.5 Data Analyses

In this research, both descriptive and inferential statistics were used. As for descriptive statistics, means, standard deviations, and variances were calculated and reported. Concerning inferential statistics, One-way ANOVA was used to investigate the research questions. Cronbach's Alpha formula was also utilized to estimate the reliability index of the proficiency and reading comprehension test.

3. Results

3.1 Reliability of the Instruments

In this study, Preliminary English Test (PET) was used to select homogenized groups of participants in terms of language proficiency as well as their reading ability. Moreover, the reading comprehension from another version of PET was used as a reading comprehension posttest. It was important to establish the reliability of these instruments. Table 1 shows the results of Cronbach's Alpha for the instruments used in the current study.

Table 1. *Reliability Indices for the PET, PET Reading Pretest, and Posttest*

Test	Cronbach's Alpha
PET	.743
PET Reading Pretest	.710
PET Reading Posttest	.821

As shown in Table 1, the reliability indices for instruments are all above .70, which is considered satisfactory.

3.2 Selecting the Participants

To select a homogeneous group of participants for this study, the initial 130 learners at the intermediate level of language proficiency were given PET. Then, based on the means and standard deviations, only those whose scores fell within the range of +/- 1 standard deviation from the mean were chosen. Table 2 shows the descriptive results for the PET scores for the initial 130 learners.

Table 2. *Descriptive Statistics for the PET Scores for the Initial 130 Adult Learners*

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
PET 130 Learners	140	29.00	27.00	56.00	40.55	.674	7.695	59.226
Valid N (listwise)	140							

As seen in Table 2, the mean and standard deviation for the PET scores belonging to adult learners are 40.55 and 7.69, respectively. To select a homogenized sample of adult learners, only those whose scores fell within 1 SD above and below the mean (40.55 +/- 7.69 =48.24/32.86) were selected. To this end, 53 learners whose scores fell beyond the +/-1 standard deviation from the mean were excluded leading to the selection of 87 learners.

3.3 Results of Pretest

A One-Way ANOVA was applied to the pretest scores of the three groups to make sure that the three groups were homogenized concerning their reading

comprehension on the pretest. Table 3 demonstrates the results of descriptive statistics for the three groups' reading comprehension pretest scores.

Table 3. *Results of Descriptive Statistics for the Three Groups' Reading Comprehension Pretest Scores*

Descriptives

Pretest Reading

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Competitive	28	15.2857	2.66468	.50358	14.2525	16.3190	12.00	21.00
Cooperative	28	14.6786	1.67892	.31729	14.0276	15.3296	12.00	18.00
Control	31	15.9355	2.11243	.37940	15.1606	16.7103	12.00	21.00
Total	87	15.3218	2.22300	.23833	14.8481	15.7956	12.00	21.00

Table 4 shows the results of the test of homogeneity of variances for the one-way ANOVA for the teenage groups' scores on the reading comprehension pretest.

Table 4. *Results of the Test of Homogeneity of Variances for the One-Way ANOVA for the Adult Groups' Reading Comprehension Pretest Scores*

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Pretest Reading	Based on Mean	1.840	2	84	.165
	Based on Median	1.330	2	84	.270
	Based on the Median and with adjusted df	1.330	2	67.638	.271
	Based on trimmed mean	1.603	2	84	.207

As seen in Table 4, all the sig values are higher than the critical level of 0.05 indicating that the homogeneity of variances is warranted. Table 5 displays the one-way ANOVA results for the adult participants' reading comprehension scores on the pretest.

Table 5. *Results of One-way ANOVA on the Reading Comprehension Pretest Scores for the Groups*

ANOVA

Pretest Reading

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	23.296	2	11.648	2.436	.094
Within Groups	401.692	84	4.782		
Total	424.989	86			

As indicated in Table 5, the sig value equals .094 which exceeds the critical value of 0.05, indicating no significant differences among the means of the three groups on the reading comprehension pretest. Therefore, it follows that the three adult groups are homogenized in terms of reading comprehension pretest scores.

3.4 Results of Posttest

As no significant differences were found between the reading score means of the three groups on the pretest, any differences among the reading score means on the posttest can be attributed to treatment types. Therefore, the post-test reading scores of the three groups were analyzed by running a One-way ANOVA. Table 4.6 presents the results of descriptive

statistics for the three groups' post-test reading scores.

Table 6. *Results of Descriptive Statistics for the Three Groups' Posttest Reading Scores*

Posttest Reading

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Competitive	28	18.5000	2.60342	.49200	17.4905	19.5095	14.00	25.00
Cooperative	28	23.7857	2.58711	.48892	22.7825	24.7889	19.00	29.00
Control	31	16.4516	2.01393	.36171	15.7129	17.1903	12.00	21.00
Total	87	19.4713	3.91134	.41934	18.6376	20.3049	12.00	29.00

Table 7 shows the results of the test of Homogeneity of Variances for the post-test reading scores of the three groups.

Table 7. *Results of the Test of Test of Homogeneity of Variances for the Posttest Reading Scores of the Three Groups*

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Posttest Reading	Based on Mean	.840	2	84	.435
	Based on Median	.823	2	84	.443
	Based on the Median and with adjusted df	.823	2	77.828	.443
	Based on trimmed mean	.840	2	84	.435

As presented in Table 7, the sig values are all above .05 indicating the homogeneity of variances is not violated. Table 8 shows the results of one-way ANOVA for the post-test reading scores of the three groups.

Table 8. *Results of One-Way ANOVA for the Posttest Reading Scores of the Three Groups*

ANOVA

Posttest Reading

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	830.286	2	415.143	71.843	.000
Within Groups	485.392	84	5.778		
Total	1315.678	86			

As seen in Table 8, the sig value equals .00 which does not exceed the confidence level i.e. 0.05. This indicates that the mean scores on the reading posttest are statistically different. To detect the differences among the groups, the post hoc Scheffe test was run. Table 9 presents the respective results.

Table 9. *Results of post hoc Scheffe Test on the Reading Posttest Scores*

Multiple Comparisons

Dependent Variable: Posttest Reading

Scheffe

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Competitive	Cooperative	-5.28571*	.64245	.000	-6.8867	-3.6847
	Control	2.04839*	.62672	.007	.4866	3.6102
Cooperative	Competitive	5.28571*	.64245	.000	3.6847	6.8867
	Control	7.33410*	.62672	.000	5.7723	8.8959
Control	Competitive	-2.04839*	.62672	.007	-3.6102	-.4866

Cooperative	-7.33410*	.62672	.000	-8.8959	-5.7723

*. The mean difference is significant at the 0.05 level.

As presented in Table 9, the competitive MALL-mediated mind map group outperformed the control group (p=.007<0.05, Mean difference= 2.04). Likewise, the cooperative MALL-mediated mind map group outperformed the control group (p=.000<0.05, Mean difference= 7.33). In a similar vein, the cooperative MALL-mediated mind map group outperformed the competitive MALL-mediated mind map group (p=.00<0.05, Mean difference= 5.28). Based on the statistical information available in Table 9, three inferences can be safely arrived at:

- MALL-mediated mind mapping in a competitive mode has a statistically positive and significant effect on adult EFL learners' reading comprehension.
- MALL-mediated mind mapping in a cooperative mode has a statistically positive and significant effect on EFL learners' reading comprehension.
- There is a significant difference between MALL-mediated mind mapping in the cooperative and competitive modes on EFL learners' reading comprehension with the cooperative mode being more effective than the competitive mode.

4. Discussion

The purpose of this study was to examine the effect of MALL-mediated mind mapping on the reading comprehension of EFL learners in competitive and cooperative modes. The results of statistical analyses indicated that MALL-mediated mind mapping was effective on reading comprehension in both competitive and cooperative modes. Moreover, there was a significant difference between MALL-mediated mind mapping in the cooperative and competitive modes on EFL learners' reading comprehension with the cooperative mode being more effective than the competitive mode.

The results of the present study confirm the findings of previous investigations concerning the positive effect of mind mapping on reading comprehension. For instance, the study conducted by Stankovic, Besic, Papic, and Aleksic (2011) showed similar results. They concluded that mind mapping can positively enhance reading comprehension. Likewise, Peng's (2011) findings showed that e-mind mapping contributes to reading comprehension development. In the same vein, Benavides's (2010) results revealed that e-mind maps led to an improvement in reading comprehension.

The results of the present study are also in congruence with the findings of some other investigations including those of Siriphanich and Laohawiriyanon (2010) and Hofland (2007). The results of these studies all indicated that using a mind map is an effective way to enhance reading comprehension. Similar to the results of the present study, Malekzadeh and Bayat (2015) showed the positive effect of using e-mind maps in enhancing reading comprehension.

The results of the current study concerning the effectiveness of mind maps can be explained in the light of the fact that the components of mind maps including images, symbols, and links enable the learners to link the vocabulary and concepts in the texts with the images and symbols and thus facilitating the learners' understanding and recalling of the texts (Gomez & King, 2014). Moreover, as Peng (2011) notes, the effectiveness of mind maps lies in that mind maps help learners use the two parts of the brain. Moreover, mind maps help learners establish a connection between language, lexical items, logical operations, and analysis, bridging the disparate functions of the brain including creativity, images, construction, and imagination, together (Peng, 2011). As Stankovic, Besic, Papic, and Aleksic (2011) contend, the effectiveness of mind maps lies in that mind maps allow students to figure out the associations and connections among the core ideas and the sub-ideas besides the information and notes associated with these ideas. Overall, the effectiveness of mind maps can be traced back to the various positive features they have. These features include the potential of mind maps in developing critical reading skills (Peng, 2011), helping learners to form an organized message based on the reading content, improve reading motivation, and enhance the level of reasoning (Siriphanich & Laohawiriyanon, 2010).

The findings of this study indicated that competitive mind mapping was effective in reading compression. The reason behind the effectiveness of the competitive mode can be traced to the idea that competition is a device to improve the motivational attraction of educational activities and as a means to promote learner engagement and excitement in the activity (Butler & Kedar, 1990). The competition used in the activities in the current study may have contributed to learners' motivational, engagement, and excitement levels which have consequently led to the improvement of their reading comprehension.

The results of the present study also showed that mind mapping in a cooperative mode was more effective than mind mapping in a competitive mode on the reading comprehension of both teenage and adult FL learners. This finding is in line with the previous research studies (e.g., Pattanpichet, 2011; Talebi & Sobhani, 2012; Woolfolk & Suwantarathip, 2010) concerning the effectiveness of cooperative learning. For instance, Pattanpichet (2011) found that cooperative learning significantly affected the learners' oral ability. Similarly, Woolfolk and Suwantarathip (2010) found that cooperative learning contributes to declining the anxiety of foreign language learners. Similarly, Talebi and Sobhani (2012) showed that cooperative learning was effective in improving oral proficiency. Moreover, Jacobs et al. (1996) found that second language learners had more opportunities to exercise a language and present more functions of language in pair work compared to teacher-fronted classes.

As Johnson and Johnson (1989) note, the effectiveness of cooperative learning can be attributed to its features including fostering positive interdependence, enhancing individual accountability, promoting interaction, improving social skills, and improving group processing. Moreover, Jacobs (1988) maintains that cooperative learning can improve the measures of learners' language use, enhance the quality of learners' language use, balance the learners' learning opportunities, and provide a learning atmosphere that is less threatening for language use. All these positive features of cooperative learning can be ascribed to justify the effectiveness of cooperative learning in this study.

5. Conclusion

The results of the present study are reminders of the interconnection between the visual input modality, the instructional environment, and the psychological aspects of competition and cooperation in reading comprehension. In essence, the findings highlight the important role of contextual variables such as the extant electronic platform and the way the raw input is organized via min mapping on the improvement of reading comprehension. Moreover, the findings of the present study concerning the effectiveness of mind mapping in general and e-mind mapping, in particular, corroborate and are corroborated by the findings of previous investigations. Moreover, the findings of the current study regarding the effectiveness of cooperative learning substantiate and are substantiated by the findings of previous studies. Furthermore, the theoretical literature also supports the effectiveness of mind mapping in general and e-mind mapping in particular. Overall, based on the findings of the current study, it is recommended that EFL teachers employ cooperative mind mapping more compared to competitive mind mapping should they intend to enhance EFL learners' reading comprehension.

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