

Effect of Mobile-Assisted Concept Mapping on Iranian EFL Learners' Self-Regulation in Vocabulary Learning

Bahareh Hosseini Dinani

Department of English Language and Literature, Isfahan Branch, Islamic Azad University,
Isfahan, Iran

Email: bahare1610@gmail.com

Azizeh Chalak (Associate Professor)

Department of English Language and Literature, Isfahan Branch, Islamic Azad University,
Isfahan, Iran

Email: azichalak@gmail.com

Abstract

Vocabulary learning has always been meaningful in second language acquisition, which raises the proposition of strategies for learning and teaching vocabulary. This study intended to investigate the effect of one strategy in vocabulary learning which is mobile-assisted concept mapping on self-regulation capacity and vocabulary acquisition. Mind Meister was utilized to draw maps in learning vocabulary. To this aim, 45 male and female Iranian EFL learners were selected as study participants. The pre and post-tests for vocabulary self-regulation and vocabulary acquisition were given to them. Two experimental groups received concept mapping materials as treatment, and the third group was considered the control group. The data were analyzed using paired sample t-test that revealed the significant enhancement of self-regulation capacity among Iranian EFL learners. Moreover, both concept mapping and conventional methods effectively improved vocabulary acquisition, but the participants' enhancement in vocabulary acquisition in the experimental group was more significant. The data were also gathered from interviews which collected the students' attitudes toward using concept mapping to control self-regulation capacity. This research may help encourage teachers to use concept mapping with learners, a useful tool that improves self-regulation skills and enhances the acquisition of vocabulary.

Keywords: Concept mapping, Iranian EFL learners, Self-Regulation, Vocabulary learning

Introduction

Learning English nowadays is a boundless action and clearly, vocabulary is assumed as a vital part of facilitating this process. Learners and instructors worry about vocabulary learning and using it in a helpful manner. Accordingly, vocabulary learning strategies are better to be in a way that advances the process of learning. Researchers and practitioners agree that strategies used in learning utilize cognition, metacognition, and inspiration, increasing success in education and performing better in tasks (Pintrich, 2000; Schunk & Zimmerman, 2007). Learners can manage their learning strategy by using instruments to manage their time or motivation over education, controlling their high anxiety, and monitoring their learning success and effectiveness of the learning strategies they use.

According to Nilsson and Mayer (2002), drawing mind maps, creating outlines, and drawing diagrams are examples of organizational strategy. Using this strategy helps learners create meaning for the materials.

Self-directed learning is an approach in which learners make decisions about the materials they want to learn, the strategy they will use, and how their progression will be assessed (Cohen, 1990). Self-regulated students are internally motivated and they trust their capability and try to use more efficient tools to achieve their goals (Cleary & Zimmerman, 2004, Ning & Downing, 2010).

The use of a concept mapping strategy is a way to regulate the learning process in vocabulary learning. Novak and Canas (2007) described concept maps as visual tools for sorting out and making a connection between ideas by connecting lines between two ideas.

Literature Review

In this section, the related literature is going to be covered theoretically and empirically.

Self-Regulation

In foreign language learning, self-regulation is mainly known as self-direction, self-instruction, and autonomous learning. Human functioning can be defined as an association between person, behavior, and environment (Bandura, 1990). The interaction between a person and the environment is significant in self-regulation. Acquiring the ability to decipher the data and be dynamic instead of straightforwardly getting the information introduced is essential for people (Alsancak & Ozdemir, 2018). Oxford (1990) claimed that language learners who are autonomous and self-regulated use a wide variety of strategies, and in other words, they take significant responsibility for their learning. Keeping up with a high degree of inspiration and tirelessness is critical to language proficiency because language learning requires a continuous investment of time and is naturally an emotional issue. According to Gorgoz and Tican (2020), self-regulated learners are responsible for their learning. They find and apply the best strategy and finally self-evaluate themselves.

Naderifar (2018) compared two specific vocabulary learning strategies and their effect on the self-regulation of Iranian EFL learners. The result showed no difference between the concept mapping and notebook-keeping strategies. Amirian et al. (2015) aimed to research the correlation between Iranian EFL learners' vocabulary size and self-regulation skills. The results revealed that the students with higher achievement in the vocabulary test also had elevated capacity for self-regulation. Karademir and Gorgun (2019) did research that was aimed at researching the self-regulation and academic self-efficacy of middle school students. This research showed that middle school students' self-regulation abilities are above the medium level. The correlation between their self-regulation ability and academic self-efficacy is positive and significant. Boroughani et al. (2023) explored the effect of mobile-assisted self-regulated learning on university students' English vocabulary learning. The outcomes of the research revealed the effectiveness of mobile-assisted self-regulated learning on vocabulary knowledge of students in experimental group. Cevik et al. (2018) researched to determine the middle school student's level of using vocabulary learning strategies in a foreign language and the connection between strategy use and the student's academic

achievement. The results revealed no correlation between language achievement and vocabulary learning strategies. Gorgoz and Tican (2020) conducted their study to investigate middle school students' self-regulation capability and vocabulary learning techniques for learning English vocabulary. The results revealed the above medium values for learners' self-regulation skills and vocabulary learning strategies, and there was a positive and significant correlation between them.

Concept Mapping

Using simple mapping tools facilitates meaningful learning, helps learners use knowledge in new contexts, and permits the maintenance of knowledge for extensive periods. They defined some steps to draw an appropriate concept map. Initially begin with a domain of knowledge. The next step is identifying the key concepts. Then the concepts should be ranked and ordered from more general to more specific. Next, it is time to construct the preliminary concept map, which had been initialized in the ordering step.

According to Sehrawat (2021), who discussed the scope of MindMeister as a tool to increase critical thinking skills, MindMeister is a web-based tool with various practical features. Users can customize their concept map with colors, style, and formatting. They can upload images connected with the idea to reflect the most common way of learning. Nasr-Esfahani et al. (2021) used this application in their study to investigate the role of E-mind mapping in changing Iranian EFL learners' strategy in language learning. The results revealed increased metacognitive strategy and memory after using the E-mind mapping technique.

Chen and Hwang (2020) investigated the consequence of concept mapping on critical thinking, English-speaking performance, and speaking anxiety. The results showed the parallelism between concept mapping and critical thinking awareness. Boroumand et al. (2020) pursued the influence of explicit teaching and the utilization of concept mapping on students' listening skills. The results substantiated that explicit instruction of the concept mapping strategy and its utilization by the L2 learners had positively affected the participants' performance on listening tasks. Liu (2016) researched to reveal the effect of mobile on vocabulary learning through the use of concept mapping strategy. The results suggested that the concept-mapping learning strategy positively affected memory for vocabulary learning. Feng et al. (2023) investigated the impact of mind-mapping strategy on Iranian EFL learners' vocabulary recall and retention. The results revealed that students who utilized mind-mapping strategy performed better regarding recalling the vocabulary. Kaveh and Rassaei (2019) intended to discover the impacts of concept mapping on the degree to which Iranian EFL students hold new vocabularies and the level of mindfulness toward vocabulary learning systems. The outcomes showed that concept mapping essentially further developed understudies' L2 vocabulary learning and was also effective for improving students' attention to vocabulary learning procedure use.

Vocabulary Learning

Inadequate vocabulary knowledge may lead to difficulty in language reception and production. The use of vocabulary learning strategies has increased recently due to their effect on facilitating and overcoming difficulties in vocabulary learning.

Harris et al. (2011) stated that increased vocabulary knowledge affects language proficiency. Researchers have revealed a correlation between vocabulary knowledge and other language skills like reading or speaking (Dalton & Grishmon, 2011). Nemati (2009) believed that learning vocabulary is challenging. For this reason, the learners have used many strategies to cope with the obstacles. Strategies might lead to a deep understanding of language (Oxford, 2003; 2011) and good performance in different skills; facilitating speaking skills (Ma & Oxford, 2014); and assisting learners in reading comprehension (Ehram, 1996). Andrade and Evans (2013) and Rasekh and Ranjbar (2003) sought to determine the effect of strategies on writing and vocabulary respectively.

Attitudes Towards Concept Mapping

Different variables are distinguished to affect language learning skills. Attitude is considered an influential variable in learning a new language. According to Ellis (1994), influencing future behavior makes attitude an essential variable in language learning. On the other hand, language learning processing will be influenced by the learners' positive and negative attitudes toward it. An individual's feelings toward an item likes or aversions, with or against, is an extensive definition of attitude proposed by Wenden (1991). Little research has been conducted on learners' attitudes toward the utilization of concept mapping as a language learning strategy in the language learning literature.

Chularut and DeBacker (2003) researched the significance of concept mapping in learning English. The study results showed that concept mapping significantly improves students' self-regulation and English achievement, revealing students' optimistic attitudes regarding the use of concept mapping in English courses. Khoshsiman et al. (2016) researched the effects of concept mapping strategy on Iranian EFL learners' attitudes toward vocabulary mastering. The concept mapping strategy positively affects learners' attitudes concerning vocabulary learning. Sabbaghan and Ansarian's (2013) study showed the learners' positive attitudes and improvement in listening skills toward using concept mapping strategy in listening comprehension.

Reviewing the related literature indicated the effectiveness of concept mapping on self-regulation capacity in vocabulary learning. However, fewer studies were conducted to examine the learners' attitudes toward using concept mapping in vocabulary learning. To fill this gap and achieve the purpose of the study, this study was conducted to respond to the following questions:

1. Does concept mapping significantly affect Iranian EFL learners' ability to self-regulate their vocabulary learning?
2. Does concept mapping strategy play an influential role in learning vocabulary by Iranian EFL learners?
3. What are the Iranian EFL learners' attitudes regarding the utilization of concept mapping strategy in self-regulation of vocabulary learning?

Methodology

Design of the Study

To achieve the study's objective, a quasi-experimental method has been employed in the present study, which contains obtrusive quantitative data and involves controlled measurement. This study consisted of three dependent variables; self-regulation in vocabulary learning, vocabulary obtainment, and the subjects' attitudes toward using concept mapping. The only independent variable in this study was utilizing a concept mapping strategy. The quantitative data was gathered through pre-tests and post-tests.

This study was conducted in one of the language institutes in Isfahan, Iran named Nasl-e Farda (IELTS Center) during the spring semester of 2022.

Participants

The study was done on 45 male and female Iranian EFL learners whose English proficiency was intermediate. The participants voluntarily partook in this research study and their ages ranged from 15 to 34. They are all Iranian EFL learners, so their native language was Persian, and the language they were learning was English. The participants were unintentionally distributed into three groups of 15; two were chosen to serve as experimental groups (self-regulation and vocabulary), and the rest were considered the control group. According to the institute's placement test, they were homogeneous in overall language proficiency. The institute's placement test has been deemed reliable, so no placement test was given to the students for the research study.

Table 1

The Demographic Background of the Participants

Number of the Participants	45
Gender	Male/ Female
Age	15-34
Level of Proficiency	Intermediate
Native Language	Persian

Instruments

An already piloted sample scale which was named the self-regulation capacity vocabulary scale (SRCvoc) was administered to the participants. The questionnaire was developed to measure five facets of self-regulation in vocabulary attainment. This scale is set by Tseng et al. (2006) and contains 20 items entailing commitment, metacognition, satiation, emotion, and environment. This questionnaire was utilized in a previous research study, and its reliability and validity had been proved, so that's why it was selected as this research instrument. Each item was answered by the participants choosing one of the options which involved a six-point Likert scale; (1) Strongly Agree, (2) Agree, (3) Partly Agree, (4) Slightly Disagree, (5) disagree, and (6) strongly disagree. Their score was one to six for each item and 20 to 120 for the whole test. In this research study, the participants were asked to answer each item about their vocabulary learning experience. It was

explained that it is intended to know to what extent these statements complement your insight and perceptivity. They were supposed to choose a number from the scale.

Table 2
Domains of the SRCvoc Questionnaire Scoring

Title	Strongly Agree	Agree	Partly Agree	Slightly Disagree	Disagree	Strongly Disagree
Score	1	2	3	4	5	6

The book taught to the participants during their course was MINDSET-1, and four levels of this book are available (Foundation level, level 1, level 2, and level 3). The intermediate students were passing the second level (level 1). This is the main reason why this book was chosen as the source of vocabulary tests in this study. Two sets of vocabulary tests containing 50 items were administered before and after starting the course and used as a pre/post-test. These two sets of vocabulary tests were drawn from this book. The tests' validity was checked by three experts in the field (TEFL) before using them. All the questions contained four items, and students were supposed to check the appropriate answer with their current vocabulary knowledge before and after the experiment.

A five-item questionnaire was used to collect more in-depth information on the student's attitudes and interests toward using concept mapping in vocabulary learning that couldn't be directly observable. The interview allowed the researcher to investigate the learners' attitudes which are not directly visible. For this aim, some of the participants were asked the five following questions:

- (a) Does your English vocabulary learning improve by using a concept mapping strategy? If yes, how? If no, give reasons
- (b) Do you use this strategy when you encounter new words?
- (c) Are you interested in improving your vocabulary as an activity to improve your language by using a concept mapping strategy?
- (d) Do you think concept mapping helps you learn English vocabulary better? Why or why not?
- (e) Do you feel the concept mapping helps you feel comfortable using words when talking to your classmates or teacher?

Mind Meister is an easy-to-use web-based tool with various practical features in which downloading the application for cell phones is accessible. The students in this research study used the application form available on its website (www.mindmeister.com). The students had access to the maps, and they could draw infinite maps for brainstorming and visualizing their vocabulary categories.

Data Collection Procedure

Doing this research study, 45 intermediate Iranian EFL learners were needed, preferably adult learners. Adult learners are usually not motivated enough and encounter many obstacles while learning vocabulary, so it seemed that working on adult learners would be effective. On the

other hand, they are more responsible for accepting participation in the study process. That's why they were selected as the target group.

A well-known language school in Isfahan, Iran named Nasl-e Farda (IELTS Center), was selected, and the institute's administrator was informed about the research and its intentions. The supervisor was guaranteed that the participants' names would stay secret and they would be aware of the consequences of the research. With the collaboration of the language school, a list of intermediate grades was given, and an underlying plan was made to go to the courses for the fundamental examination and arrangements for directing the experiment. The classes that were preferred for research were preferably on-site classes. Before every research study, it is necessary to have homogenous participants by giving placement tests and categorizing them into proper groups. In this research project, the institute's placement test was reliable enough, and all the participants were pre-intermediate or intermediate learners in terms of overall English proficiency.

Thirty minutes before starting the courses, the initial evaluation was distributed between three groups, and they were asked to answer it carefully. The self-regulation, vocabulary, and control groups were given the SRCvoc and tested. All the participants in two experimental groups needed to be instructed about concept mapping strategy in vocabulary learning and the MindMeister application to draw concept maps. The teachers gave two videos explaining the concept mapping strategy and the application's use. In the course's first session, instructors were asked to share with the experimental group in the class's WhatsApp group. The participants received instruction on the research process and were asked to generate concept maps of the vocabulary items they encountered throughout the current course. They were made to develop concept mapping with the vocabulary given by the instructor. More explanations about the way were given by teachers to them if needed. The control group was asked to study and review the vocabulary instructed during the semester by the conventional method they used to apply.

In about thirteen sessions, students in the experimental group wanted to create one or multiple concept maps according to the topics they studied during the course. An example of a concept mapping strategy outlined by one of the participants is demonstrated in Figure 1.

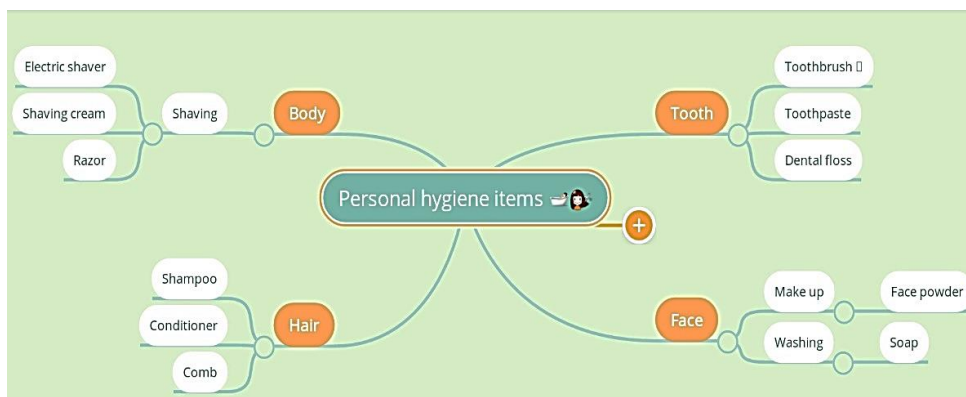


Figure 1. A sample of Concept Mapping Strategy

Finally, the participants completed the questionnaire and vocabulary test as a posttest. In the 13th session of the class, students in the self-regulation, vocabulary, and control groups were given the posttests. At the end of the study, five questions were sent as a link to Google Docs to the experimental group's participants. This survey aimed to get feedback on the experimental group's attitude toward concept mapping in vocabulary learning.

Data Analysis Procedure

The data gathered in this study through questionnaires were analyzed quantitatively by comparing the participants' performance in the self-regulation and control groups before and after the treatment. The scores of the students in the self-regulation group through pre-test and post-test were collected and compared to answer the first research question. Comparing the pretest and post-test of self-regulation and control groups, the IBM SPSS, Paired-Sample t-test was run on both pre-tests and post-tests to analyze their performance before and after applying the treatment. The participants' attitudes were checked to answer the third research question and complete the data gathering.

Results

The highest result in the self-regulation group amounts to 99, and in the control group was 94, which translated to the highest self-regulated capacity among the participants of this group as pre-tests. The highest post-test results were 108 and 96, respectively. The highest score in the vocabulary test amounts to 42 and in the control group 38, as pre-tests. The post-test results were respectively 49 and 45 for the experimental and control groups. They translated to greater vocabulary knowledge among the participants of the group.

In the next step of the procedure, the collected data must be tested to determine the Normality of data Distribution. To do so, this Null hypothesis should be considered:

H0: The distribution of the collected data is not Normal.

The Kolmogorov-Smirnov and Shapiro-Wilk tests were run to determine the normality of the data. All the collected data were analyzed by IBM SPSS statistics (version 26) software. This test's results revealed that the data distribution is normal. The results of the Kolmogorov-Smirnov and Shapiro-Wilk tests for the self-regulation group's pre-test and post-test are shown in Table 3.

Table 3
Kolmogorov-Smirnov and Shapiro-Wilk Tests for EG1 Pre/ Post Tests

Group	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
EG1-Pre	0.116	15	0.200	0.972	15	0.883
EG1-Post	0.115	15	0.200	0.957	15	0.648

As the above table indicated, the Sig (Statistical Significance/P-values) of this self-regulation group in pre/post-tests are higher than 0.05 (alpha level), translated as the data

distribution's normality. The data collected from the pre/post-tests of the experimental and control groups were analyzed through the Paired-Sample T-test, whose results are shown in the following phases. It should be mentioned that this test was applied to compare the means of the control group (CG) and the experimental group (EG). All the analyzing process was recalculated to obtain higher reliability and validity.

Table 4
Results of Paired-Sample T-test of Self-Regulation and Control Groups

Pair	Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig (2-tailed)
						Lower	Upper			
Pair 1	EG1 pre-	1	-							
	EG1 post	5	11.66	6.48	1.67	-15.26	8.07	-6.96	14	0.00
Pair 2	CG pre-	1								
	CG post	5	0.06	1.79	0.46	-0.92	1.05	0.14	4	0.88

As shown in Table 4., the conventional vocabulary teaching method (control group) did not affect the learners' self-regulation capacity in vocabulary attainment (sig.>0.05). The hypothesis of this research is the effect of mobile-assisted concept mapping on Iranian EFL learners' ability to self-regulate vocabulary learning. The Null hypothesis is mentioned below:

H0: The use of mobile-assisted concept mapping does not significantly affect the Iranian EFL learners' self-regulation capacity in vocabulary achievement.

According to the information in Table 4., the concept mapping strategy significantly affects the learners' self-regulation capability in vocabulary learning. It is worth mentioning that the alpha level (Sig.) in the self-regulation group is lower than 0.05, which means that the treatment was effective in this experimental group. By analyzing and comparing the means, statistical significance, and other information provided in the T-tests of EG1 and CG1, it can be understood that the use of concept mapping positively affected the self-regulation capacity of Iranian EFL learners.

When the pre/post-test data were compiled from the vocabulary group and control groups, the normality of the data was determined by running the Kolmogorov-Smirnov and Shapiro-Wilk tests, and the test results revealed that the data distribution was normal. A paired-sample T-test was utilized to evaluate the data.

The hypothesis of this research is the effect of mobile-assisted concept mapping on Iranian EFL learners' vocabulary acquisition. The Null hypothesis is mentioned below:

H0: Mobile-assisted concept mapping does not significantly affect Iranian EFL learners' vocabulary acquisition.

Table 5
Results of Paired-Sample T-test of Vocabulary and Control Groups

Pair	Group	N	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	Df	Sig (2-tailed)
						Lower	Upper			
Pair 1	EG2pre-EG2post	15	-9.20	2.54	0.65	-10.60	-7.79	-14.02	14	0.00
Pair 2	CG pre-CG post	15	-3.53	2.99	0.77	-5.19	-1.87	-4.56	14	0.00

Table 5. showed that concept mapping strategy considerably affected vocabulary acquisition in Iranian EFL learners. The Statistical Significance (Sig.) in the experimental group is lower than 0.05, translated as the efficacy of treatment on vocabulary acquisition. By taking a brief look at the information provided in Table 5., it is gained that the conventional method for vocabulary learning positively affected the learners' vocabulary acquisition because the P-value (Sig.) is lower than 0.05. It should be pointed out that both conventional and concept mapping methods increase the learners' vocabulary learning.

In the following part, the statistics for the vocabulary and control groups are shown in Table 6. to see which method, concept mapping or conventional, mainly affected vocabulary acquisition.

The information in Table 6 reveals the increase in vocabulary acquisition in experimental (vocabulary) and control groups. As illustrated, the Means of the experimental group in the pre-test and post-test are 31.87 and 41.07, respectively, indicating an increase in the Mean of the post-test. The Means of the control group in the pre-test and post-test are 30.47 and 34.00, respectively, which also shows the increase in the Mean of the post-test in this group.

Table 6
The Statistics of Vocabulary and Control Groups

Pair	Group	Mean	N	Std. Deviation	Std. Error Mean
Pair 1	EG2 pre	31.87	15	6.534	1.687
	EG2 post	41.07	15	6.431	1.660
Pair 2	CG2 pre	30.47	15	5.343	1.380
	CG2 post	34.00	15	6.188	1.598

Something worth mentioning is how much increase happened in the Mean of post-tests in the experimental and control groups. The results showed that the participants in the experimental group gained better scores in the post-test after the treatment because the Mean changed more compared to the Mean in the control group's post-test.

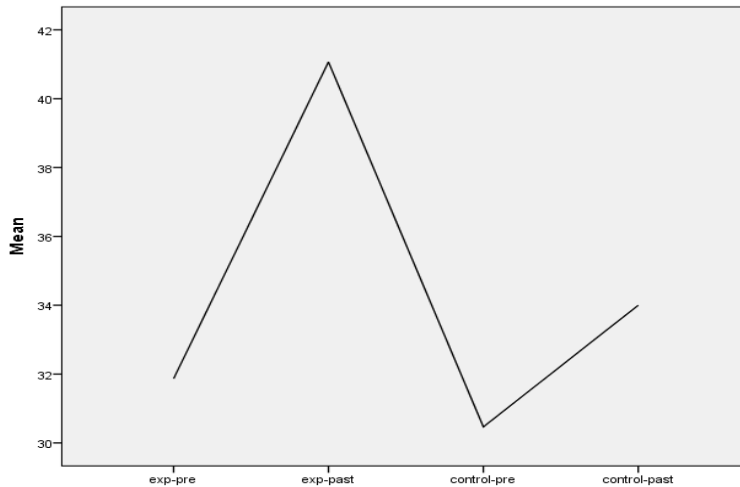


Figure 2. Comparison Between the Means of the EG2 and CG's Answers

The means or averages of the results in pre-tests and post-tests of the experimental and control groups are shown in Figure 2. As the crooked-line chart demonstrates, the advancement in vocabulary acquisition took place in both post-tests of experimental and control groups, but the amount of increase in the experimental group is vividly more.

Seven subjects gave comments on their attitude toward using concept mapping in vocabulary learning.

Six participants out of seven showed a positive attitude towards the concept mapping strategy. They believed this strategy could help them classify their mind and make memorization easier. They felt their vocabulary expanded more after utilizing concept mapping for vocabulary learning. One of them noted that *it takes more time, but it is helpful. I believe that by drawing the relationship between different new words, it is easier to memorize them. In addition, by looking at the diagram, my brain can absorb the meaning much easier than only reading.* They also believed that vocabulary learning is better by using this strategy. *It is much easier to learn the words that are related, and also our mind will have more power to remember them; Therefore, my reason for this answer is that the mind categorizes the words, and I use them much better and in better places, and I do not worry about forgetting words anymore.*

One out of seven participants believed this strategy couldn't help them expand their vocabulary. In other words, they didn't feel comfortable using this strategy. *I think that it was a little time-consuming, especially for me as a busy person. I prefer some easy-constructing way to learn vocabulary.*

Discussion

An experimental investigation was conducted to examine the first research question that this study addresses. The results signified that the concept mapping strategy significantly improved the capacity for self-regulation.

The results of the current study (see Table 4.) demonstrated that the subjects who took part in the experimental group and used the concept mapping strategy to memorize and review vocabulary showed significant improvement in controlling and regulating their vocabulary learning.

The results align with the study conducted by Naderifar (2018). The difference was that they compared two specific vocabulary learning strategies and their effect on Iranian EFL learners' self-regulation in vocabulary learning. The result showed no difference between the concept mapping strategy and notebook-keeping strategy regarding their impact on self-regulation in acquiring vocabulary. It can be revealed that this study's results are compatible with their research regarding the effect of concept mapping on self-regulation capacity. In addition, the results align with the study of Gorgoz and Tican (2019) that self-regulated learners used different vocabulary learning techniques and utilized concept mapping. They were also in line with Shirzadeh et al. (2014), who demonstrated how students could relate new vocabularies with their experience using concept mapping. This result is regarded as a self-regulatory issue that can be improved using concept mapping.

The results of the second research question (see Table 5.), represented the efficacy of both concept mapping and traditional methods in boosting vocabulary acquisition by Iranian EFL learners. To show the predominance of concept mapping strategy on vocabulary expansion, the increase in the mean score of the experimental group was shown as predominated.

As Liu (2016) and Kaveh and Rassaei (2019) stated in their research, the concept-mapping learning strategy positively affected memory for vocabulary learning and further developed the understudies' vocabulary learning. Their results corresponded to the results of this effort.

The last research question was answered by applying an interview to the participants in experimental groups regarding understanding the subjects' attitudes toward concept mapping.

The results are in line with Khoshsima et al. (2016), who investigated that the concept mapping strategy in vocabulary learning positively affects learners' attitudes toward vocabulary learning. Fewer studies have been conducted on the learners' attitudes toward concept mapping. Still, the reviewed research showed the learners' positive attitudes. Sabbaghan and Ansarian's (2013) research study is also a demonstration of a positive attitude toward applying concept mapping in listening comprehension, which is in line with the present study's results.

Conclusion

Mobile-assisted concept mapping can be a valuable resource for making learners responsible in the learning process. Drawing maps with MindMeister offers many language learning benefits by allowing learners to visualize the vocabulary they are learning through its innovative features.

Various pedagogical implications can be proposed based on the fact that concept mapping positively influences learners' vocabulary self-regulation strategies. Instructors can apply this strategy in their classes based on the students' preferences.

When it comes to research limitations, this study is no exception. A small number of participants is one of them. This study can be performed at a scale with a more significant number of participants through other established organizations. Another point of limitation is that the study participants were primarily adults and busy with different aspects of their lives, so they did not spend enough time or got into trouble drawing maps. So, further studies are needed on different levels of EFL learning. The subjects of this study were both men and women. Other projects should be tested with gender disparity to achieve the best results in this case. Another point might be that the application used for drawing maps in the process of the study was MindMeister, with limited access to all features in its free version. To conduct other research studies, an account for MindMeister should be bought to get the advantage of every single feature of the application.

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