Comparing the Effects of Mind-Mapping vs. Concept-Mapping Techniques on Iranian EFL Students' Reading Motivation, Reading Comprehension, and Willingness to Communicate

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Abstract

As there have been few studies on the comparative effects of mind-mapping (MM) and concept-mapping (CM) techniques on learning English language skills and sub-skills, this survey pursued to scrutinize the impacts of these techniques on reading motivation, reading comprehension, and willingness to communicate (WTC) of Iranian EFL students. To fulfill these objectives, 78 intermediate EFL students were selected based on non-random sampling and accidentally assigned to two experimental groups (EGs) and one control group (CG). They were then pre-tested using a reading motivation test, a reading comprehension test, and a WTC test. Next, the intervention was conducted on the three groups. The MM technique was employed to teach 16 English reading texts to one EG and the CM technique was applied to teach the same texts to the other EG. None of these techniques were used to teach the texts to the CG. When the intervention ended, the post-tests of reading comprehension, reading motivation test, and WTC were given to the three groups. The outcomes of the One-Way ANOVA tests and the post-hoc Scheffe tests revealed that there was a substantial difference between the scores of the EGs and the CG on the three post-tests, with the results being in favor of the EGs. In effect, the findings indicated that the MM and CM techniques enhanced reading motivation, reading comprehension, and WTC of the experimental participants equally. Finally, the implications and conclusions of the research were explained.

Keywords: concept-mapping technique, mind-mapping technique, reading comprehension, reading motivation test, WTC

1. Introduction

MM is a concept that has its roots in cognitive psychology which holds that learning occurs when new ideas are assimilated and proposed into various frameworks and categories (Nasr-Esfahani et al., 2021). This structure, referred to as a person's cognitive structure by Novak and Canas (2006), is created as a result of the linkage of newly acquired knowledge with previously held knowledge. A mind map is described as a visual instrument that highlights the connections between distinct notions to demonstrate their fundamental structure and how those connections engagingly relate to the issue for the reader to grab their attention (Tucker et al., 2010). Mind maps are an information-organizing approach used to highlight the links between diverse aspects in a visual manner that is obvious and pleasant via the use of different drawings, colors, images, and shapes, according to Buzan and Buzan (2006).

Mind maps encourage children to acquire new materials by making them arrange their information and add graphics and colors. For the reason that learners are developing a two-dimensional space to link concepts and opinions that are pertinent to one another, these maps are demonstrated to reduce extrinsic cognitive load (Nesbit & Adesope, 2006). As a metacognitive tool, mind maps may be used to help students make connections to the information in meaningful ways and allow them to generate a pictorial representation to support their learning. For instance, Fearzana et al. (2002) state that using MM with a problem-based learning curriculum increased deeper learning in addition to helping medical students with their studies. Moreover, mind maps have been employed as tools for reflection that enable greater linkages to be created with the subject matter (Budd, 2004). By using mind maps, teachers may change their teaching strategies and possibly teach English to the students better (Nesbit & Adesope, 2006).

CM is an additional beneficial teaching strategy. It is a pictorial representation that may be exploited to support students in organizing and formulating concepts (Novak, 1990). This strategy is a useful strategy that instructors can utilize in their classes to improve the recall, review, communication, and problem-solving abilities of the pupils. By organizing the information the students capture, CM helps them learn more efficiently (Novak, 2002). Moreover, CM has been demonstrated to help learners organize their thoughts and assist their growth (Moreira & Moreira, 2011; Folse & Lockwood, 2010). For instance, Buran and Filyukov (2015) suggest that CM might efficiently promote meaningful learning in English-speaking courses by enhancing students' associative thinking.

CM is a visual organizing technique that can assist individuals and groups in explaining and examining their understanding of a subject (Kinchin, 2000). Because of this, CM seems to be a successful method of educating students about new material. The benefits of creating visual-verbal representations of knowledge and the significance of linking new information to existing knowledge and experience are some of the justifications for CM (Jonassen et al., 1999; Malmir & Khosravi, 2018; Le, 2009).

The CM can be used by pupils as a technique to combine prior information and novel knowledge into comprehensive pictorial maps. According to Liu et al. (2010), students can learn how knowledge relates to past knowledge in curriculum areas by creating a CM. Also, the visual structure of information aids comprehension and memory. Sabbaghan and Ansarian (2013) assert that CM has also been shown to enhance the outlooks of the pupils about English language learning.

CM is one of the strategies that might improve students' reading comprehension, according to a recent study (Chang et al., 2002). Understanding word strings in a reading passage is what is meant when someone says they are reading (Dakhi & Damanik, 2018; Desta, 2020). It is the most crucial ability that students, particularly those studying a foreign language, must possess to further their knowledge and information collection (Pangestika, 2018).

In particular, Pangestika went on to say that as reading is a key constituent of learning English, it is essential for EFL students. As a result, it is crucial to get pupils interested in the reading passage during the process of learning and teaching. Instructors must, however, possess the ability to inspire kids to engage in reading (Tatipang et al., 2021; Astriani et al., 2020). Pupils with more motivation are more likely to participate in learning tasks that advance their knowledge and meet their learning purposes since they pay heed and efficiently utilize class periods (Jones, 2009). Thus, instructors must be able to encourage kids to read (Fisher, 2013).

A pupil's inclination, longing, drive, and need to engage in the learning process are all examples of motivation in learning (Feng et al., 2013). Reading motivation is crucial for getting students interested in reading, which can improve reading comprehension (Indrayadi, 2021). Motivation is a driving force behind language learners' efforts (Astuti, 2013). It is essential to the success of learning (Hussain et al., 2020; Lai, 2013). Motivated pupils are more likely to participate in learning tasks that advance their knowledge and meet their learning purposes since they pay heed and efficiently utilize the time of the class (Bernard, 2010). Learning outcomes for pupils would improve if a variety of incentive techniques were used (Mahadi & Jafari 2012).

Regarding reading motivation, it is thought to be crucial for reading engagement that influences reading results and instructional performance (Guthrie et.al, 2006). Motivation for reading refers to students' readiness, inclination, attitudes, and perception in terms of reading (Alhamdu, 2015). Students' interests, efficacy, and ambitions can be impacted by reading motivation since these elements can increase comprehension results (Middleton, 2011).

Middleton believes that rising motivation could lead to better outcomes in comprehending language. Reading motivation was primarily created to improve comprehension levels throughout the teaching and learning process. If pupils aren't encouraged to interact with a reading piece, they won't be able to improve their understanding. Students who lack reading motivation struggle to read (Sani et al., 2011). Motivation to read is therefore crucial for acquiring reading comprehension (Saeheng, 2017). Educators ought to be capable of making the process of learning lively and pleasurable by including the pupils in the course of training and learning (Dornyei, 2001). In this regard, instructors must be able to motivate pupils to read and create a fun learning environment.

Many language learners' inclination to enter L2 communication settings is hindered by a lack of motivation (Fan, 2022). This problem demonstrates the existence of a different construct that stands between the ability to communicate and the use of that ability (Dörnyei, 2005). This concept is known as Willingness to Communicate (WTC) which was introduced by MacIntyre et al. (1998). According to their definition, this idea is "a preparedness to engage the conversation at a precise time with particular people, employing an L2" (p. 547).

WTC was also described by MacIntyre and Charos (1996) as a steady propensity towards communicating with someone you like. The students' condition of cognitive planning to use the English language in their conversation is referred to as WTC, according to Kurk (2022). As the desire to communicate may lead to genuine communication that increases foreign language competence, MacIntyre and Vincze (2017) view WTC to be the primary goal of foreign language acquisition. According to Öz et al. (2015), WTC is a complex concept that combines emotional, communicative, linguistic, and social-psychological factors. It may be used to characterize, explain, and forecast the communicative behavior of language learners in an L2.

As the above-defined variables play a vital role in English language learning, this research intended to examine the effects of CM and MM techniques on developing reading motivation and reading comprehension of Iranian EFL students. In addition, this research aimed to examine the impacts of the mentioned techniques on enhancing Iranian EFL learners' WTC.

2. Review of the Literature

The mind map is a notion that Tony Buzan created in 1970. It is a visual method that unifies all of the cerebral abilities—word, picture, logic, number, color, rhythm, and spatial awareness—in a single, extraordinarily potent way. Mind maps can be used in the classroom for reviewing and testing, getting a broad overview of the subject, focusing, remembering knowledge, arranging specifics, cooperating, presenting, making plans, analyzing ideas, and brainstorming (Buzan, 2017). The central concept or keyword in a mind map is surrounded by supporting concepts that radiate outward, and additional information is shown as branches. Using connecting lines, demonstrates the links between concepts conducted in an L2 (Yan & Kim, 2023).

In foreign language instruction, mind maps have been used as a method to engage pupils' prior knowledge of the topics and help them organize and remember vocabulary. The exercises can be completed independently or as a group project in classes (Feng et al., 2023). Based on Casco (2009), in place of writing bullet points, paragraphs, or language relating to the topic, the instructor might instruct pupils to make mind maps. There are several investigations on the application of MM in foreign language instruction to improve a variety of abilities, including the writing of EFL students (Wangmo, 2018). This approach is deemed an effective tool for teaching the students the fundamental writing skills needed, with results showing a favorable effect on students' writing abilities (Wenying, 2022).

MM in education has been proven to offer a number of benefits, including enhancing students' summarizing abilities, helping teachers introduce new concepts and subjects, and helping students retain and recall knowledge more quickly and effectively (Brinkmann, 2003). MM, according to Arulselvi (2017), aids in idea generation, organization, and brainstorming both within and outside of the classroom. Although Brinkmann (2003) said that using mind maps to enhance teaching and learning was not a good concept, they have many practical uses in this area.

According to Brown (2007), using a mind map is a simple method of expressing learners' opinions without being worried about the structures. It enables them to unify their thoughts pictorially and maintain information with ease. It is a figure that shows the ideas, vocabularies, and other notions that are related to the core through branches and have a link to its antecedents (Bhattacharya & Mohalik, 2020). It enables individuals to create a distinct framework regarding the mind-focal map's point. There are countless charts and diagrams in which to show this framework. According to Liu and Yuizono (2020), MM is a teaching method that makes use of diagrams to show how one subject or idea relates to others.

Concept maps were created at Cornell University as part of Novak's research program that aimed to track and comprehend developments in kids' scientific understanding (Novak, 1990; Novak, 2002). They have since been applied to reflect the knowledge of expert people and teams in governments, education, and industries, as well as to promote meaningful learning in science and other areas. Concept maps are visual aids that, in the words of Novak (2002), "highlight the most essential thoughts and represent the relationship of facts or concepts inside a text and assist learners create questions about the material and learn better" (p. 15). CM has grown in popularity over the past several years and has become one of the fundamental components in strategies for enhancing the teaching-learning process (Espinosa et al., 2007). Concepts are often contained in boxes or circles of some kind, and links amongst concepts are shown by a linking line that joins two concepts. Connecting words or linking phrases on the line defines the connection amongst the two topics (Novak & Caas, 2008).

Plotnick (2018) asserted that CM is accessible and that computer employment increases its potential advantages. He claims that computer-based CM has numerous advantages over paper-based maps, including the capacity to link concept maps, record audio, add videos, and amend incorrect placements without redoing the map. As the map starts with a root premise that is a crucial question, according to Alosaimi (2016), it is comprehensive. The map is then produced by drawing on the basic knowledge of the students, adding new strategies and linking them to ones that have already been made, and elaborating on the knowledge that has been retrieved inside a network similar to a mode. CM is mostly applied to teaching models and recognizing and dispelling common misunderstandings about education (Wang et al., 2018).

The CM and MM technique stems from 'constructivism' - the philosophy of knowledge. The vital plank behind the constructivism theory is that human learning is created and that students construct new knowledge upon the foundation of previous learning. Based on the constructivist

method, people construct knowledge in their minds when they have real-life experiences (Null, 2004). In fact, according to Glasersfeld (1989), constructivism is concerned with the process of making information. The information that we have created relies on what we know in advance, what sort of experiences we have had, how we organize these experiences in our information structure, and what we believe about these experiences. Our worldview is shaped by our interpretation of these experiences. Educators cannot completely transfer their own perceptions to learners since students and teachers do not have similar knowledge and experiences. The goal is to bring up students who make their questions and who have enhanced critical thinking abilities. The use of these instruments which can attain this purpose is really significant since it provides lasting and meaningful learning (Aalia, 2004).

The efficacy of both of the aforementioned strategies on language acquisition was demonstrated by certain empirical investigations. Researchers Mousapour Negari and Talebinezhad (2009) examined the influences of CM as a teaching method on EFL learners' abilities to self-regulate. Sixty college students were included in the investigation. Thirty pupils from the control and experimental groups each received an assignment at random. They were studying either translation or English literature and had moderate English language skills. The MTELP and MSLQ scales were the tools used to gather the research data. The outcomes revealed that participants enhanced their self-regulation in writing activities as a consequence of the CM technique's explicit training.

Thuy Trang (2017) looked at the impact of CM on the reading skill of EFL pupils as well as their opinions regarding its use in reading instruction. Sixty-four first-year EFL students participated in this investigation. The treatment group and the CG were given to these kids. In the reading course, the two groups got the same number of sessions on reading texts, but the experimental group was the only one to get the CM intervention. The findings depicted that there was a substantial change in the participants' reading skills, with the EG members performing better than the CG students. The survey also demonstrated that pupils' opinions toward CM in reading courses were favorable. They found CM to be enjoyable while learning to read and thought it was helpful when teaching reading.

The influences of the CM technique on EFL students' critical thinking ability and speaking anxiety were examined by Alice Chen and Hwang in 2019. The treatment (n=37) and control (n=35) groups each had 72 EFL students. According to the pretest findings, the individuals in the two groups had similar competence levels, critical thinking ability, and speaking anxiety while speaking in an EFL language. The treatment learners were told to create concept maps following each listening activity, and they used these maps to help them frame their responses to the requisite speaking activities. The posttest findings showed that CM can reduce speaking anxiety in EFL learners and have a good and substantial impact on their English speaking ability and critical thinking awareness. Also, there is a statistical correlation between CM, learning outcomes, and

critical thinking. Also, a strong inverse association between speaking anxiety and the other factors was found by the findings.

Alwadi and Ismail (2019) investigated how well the MM technique worked to develop the speaking skills of EFL primary school pupils. They want to learn more about the challenges that students have when speaking in class. It was discovered that worry had the greatest impact on how the EFL primary school kids spoke. Also, the MM technique, which inspired kids, was shown to be a successful technique for EFL primary school children.

Alqasham and Al-Ahdal (2021) used the MM technique to advance learners' writing productivity and thinking. At Qassim University in Saudi Arabia, the respondents were 40 male English students who performed below average in their writing. The intervention employed a free digital MM tool over three weeks, concentrating solely on writing ability. The application of MM, according to the findings, increased pupils' enthusiasm for writing. MM as a kind of brainstorming device has proven to significantly improve Saudi EFL pupils' attitudes toward writing abilities.

In another empirical research, Alba (2021) looked at the application of MM software for EFL students to acquire vocabulary. Sixty-two students were chosen as a result, and they were split into control and treatment groups. Besides using numerous mind maps in the classroom, the EG received vocabulary education in the sections from the textbooks of the learners. In 12 sessions, 12 paragraphs, with their new terms, were studied. The CG received the conventional technique of going through the definitions with the educator's explanation and the use of the dictionary. A vocabulary post-test was created based on the reading texts and given to the participants after the intervention sessions. The outcomes of the learners' pre- and post-tests showed that the EG outperformed the CG at a significant level.

Wannas et al. (2022) examined the effects of the MM method on mastering ESP words. The EG acquired MM techniques while the CG got standard instruction. The effectiveness of the MM strategy was evaluated using both a pre-test and a post-test. The consequences of the investigation demonstrated that there were substantial variations amongst the EG's pre-test and post-test. The post-test mean scores for the EG and CGs, however, showed no appreciable changes, indicating that the influences of MM and standard vocabulary instruction on language development were equivalent.

The problem that persuaded us to conduct this study is the challenges that EFL learners have in reading comprehension and their lack of reading motivation. Also, many EFL learners have no propensity to communicate in English. We are optimistic about solving these problems by using MM and CM in Iranian EFL classes. Given the significance of the teaching methods discussed above, the present study chose to look at how MM and CM helped Iranian EFL students improve their reading motivation and comprehension as well as their WTC. As a result, three questions were raised below:

RQ1. Do CM and MM techniques affect Iranian EFL learners' reading comprehension differentially?

RQ2. Do CM and MM techniques affect Iranian EFL learners' reading motivation differentially?

RQ3. Do CM and MM techniques affect Iranian EFL learners' WTC differentially?

Based on the research questions, three null hypotheses were suggested:

HO1. CM and MM techniques do not affect Iranian EFL learners' reading comprehension differentially.

HO2. CM and MM techniques do not affect Iranian EFL learners' reading motivation differentially.

HO3. CM and MM techniques do not affect Iranian EFL learners' WTC differentially.

3. Methodology

3.1. Research Design

The study employed a quasi-experimental design including pre-test-treatment-post-test to assess the effects of CM and MM techniques on reading motivation, reading comprehension, and WTC of Iranian EFL students. There were a control group (CG) and two experimental groups (EGs) of MM (Mind-mapping) and CM (Concept-Mapping) in this study. The defendant variables were reading motivation, reading comprehension, and WTC and the independent variables of this study were CM and MM techniques.

3.2. Subjects

Due to the existing constraints, 78 Iranian EFL learners were selected for this study from a pool of 103 students using a non-random sampling procedure. They were recruited from an English Language institute in Ahvaz, Iran. Their Oxford Quick Placement Test (OQPT) band score was applied to establish their intermediate English ability, ensuring a representative sample. The chosen individuals were separated into a CG and two EGs of MM and CM. It should be mentioned that only male participants—whose ages ranged from 17 to 27—were included in this study due to current administrative and educational constraints.

3.3. Research Instruments

The OQPT was the first tool exploited in the present experiment to homogenize the subjects. That assisted the researchers in choosing the same subjects. The students were considered to be the intermediate and the study's responses were those who scored between 40 and 47 on the test's 60 multiple-choice questions.

A reading pre-test created by the researcher and based on the material in the participants' textbook served as the second research instrument. There were 20 objective questions on a reading comprehension test. There were multiple-choice, yes or false, and fill-in-the-blank questions. The

KR-21 formula was utilized to determine the instrument's reliability (r=0.89), and several professors of applied linguistics from one University of Ahvaz verified the instrument's validity.

A WTC questionnaire that was modified from Cao and Philp's observation program served as the study's third tool (2006). The researcher considered the aforementioned questionnaire to be a valid tool to utilize in this research because it was extensively used in earlier investigations. To guarantee that all respondents understand the survey items, this instrument has been translated into Persian. There were 12 items in it, and students may select whether to respond in English or Iranian on a 6-point Likert scale (1 being not at all willing and 6 being very willing). A team of English professionals evaluated the questionnaire's Persian translation. Cronbach Alpha was applied to attain its reliability (r=.82).

A questionnaire was used as the fourth method to acquire information on the pupils' motivation to read. It was modified from Wang and Guthrie's Motivation of Reading Questionnaire (2004). To evaluate the validity and reliability of the questionnaire, it was adjusted and piloted with students from other schools who were in the same year. Four doctoral-educated English department instructors participated in the face and content validation research. The four validators in particular did not reveal any appreciable differences in the Persian translation from the original. The questionnaire was then piloted with a group of pupils who were all performing at the same level. Knowing the ambiguities contained in each questionnaire item might aid the researchers when they pilot the questionnaire (Dawson, 2002). Seventy-eight individuals gave Likert scale responses to 53 modified questionnaire items about reading motivation. Based on Cronbach Alpha, this instrument had r=.83 reliability rating.

It should be emphasized that both of the aforementioned questionnaires served as the study's pre- and post-tests; they were given before and after the instruction. A reading post-test created by the researcher was the final instrument employed in the present investigation. The pre-test was modified slightly by the researcher, who then utilized it as the post-test. The reading post-content test and item count were identical to those of the reading pre-test in all other respects. The pre-test reminders for the participants were only removed by switching the sequence of the items and the alternatives. The reliability of this tool was determined using KR-21 (r=0.85). The validity of all instruments was verified by some English professors teaching applied linguistics. They read the items of the pre and post-tests confirmed most of them and modified some items to be suitable for the research. In addition, all instruments were piloted on another similar group of students. The researchers administered the mentioned instruments to 15 intermediate male students in another English institute to be sure about their appropriateness for the target groups.

3.4. Research Procedure

One hundred and three Iranian EFL students were chosen for the initial stage. The OQPT test was then given to them. The target group for the study consisted of 78 intermediate students

who were then split into three groups at random: CM, MM, and control. Before starting any therapies, they underwent a reading comprehension, reading motivation, and WTC pre-test to gauge their current level of reading motivation, comprehension, and WTC. The three groups were used as practice subjects for the treatments.

In terms of treatment, in one EG the MM method was used. The instructor employed the MM approach to engage and prepare the pupils before presenting each reading text. This technique was used to help learners organize and represent what they know. In the second EG, the teacher applied the CM technique to get the participants to come up with concepts. The teacher asked the students to create different concept maps to show their present understanding of different topics. The CG participants were not taught to read texts using either of these two methods, on the other hand.

Under the direction of the researchers, the therapy lasted for 23 sessions of 50 minutes each. The OQPT was given to the students after the goals and methods of the study were outlined to them in the first session. The group members took three sessions of pre-testing. The therapy was given throughout 16 sessions. All groups completed the post-tests for reading motivation, reading comprehension, and WTC in the final three sessions. The collected data were then appropriately analyzed.

3.5. Analyzing the Data

To analyze the data and come up with an appropriate response to the research questions, version 23 of the SPSS software was used. The effects of instruction using MM and CM strategies on the respondents' reading motivation, comprehension, and WTC were examined employing One-Way ANOVA tests and post-hoc Scheffe tests.

4. Results

Many One-Way ANOVA tests were conducted to analyze the data and obtain the final results in the tables below.

Table 1.

Descriptive Statistics of Reading Comprehension Pre-test

	N	Means	Std. Deviations	Std. Errors	95% Confidence Interval for Means		Minimum	Maximum
					Lower Bounds	Upper Bounds		
MM	26	13.07	2.01	.39	12.26	13.89	8.00	17.00
CM	26	13.42	2.04	.40	12.59	14.24	10.00	19.00
CG	26	14.03	2.40	.47	13.06	15.01	11.00	18.00
Total	78	13.51	2.17	.24	13.02	14.00	8.00	19.00

The reading pre-test descriptive data for the three groups are shown in Table 1. In fact, the MM group, CM group, and CG had mean scores of 13.07, 13.42, and 14.03, respectively. This suggests that the three groups performed almost equally on the reading comprehension pre-test.

Table 2

Inferential Statistics of Reading Comprehension Pre-test

	Sum of Squares	df	Mean Squares	F	Sig.
Between Groups	12.33	2	6.16	1.31	.27
Within Groups	351.15	75	4.68		
Total	363.48	77			

The difference amongst the groups is not meaningful as shown by Table 2 where Sig (.27) is higher than 0.05. They really did equally on the reading pre-tests.

Table 3

Descriptive Statistics of Reading Comprehension Post-test

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bounds	Upper Bounds		
MM	26	16.15	2.34	.45	15.20	17.10	13.00	22.00
CM	26	16.96	1.92	.37	16.18	17.74	12.00	20.00
CG	26	14.92	3.77	.73	13.39	16.44	11.00	29.00
Total	78	16.01	2.88	.32	15.36	16.66	10.00	28.00

The reading post-test descriptive statistics for each group are shown in Table 3. The mean score for the CM group was 16.96, the average score for the MM group was 16.15, and the average score for the CG was 14.92. In the reading post-test, it seems that the groups performed differently.

Table 4

Inferential Statistics of Reading Comprehension Post-test

	Sum of Square	Df	Mean Squares	F	Sig.
Between Groups	54.79	2	27.39	3.50	.03
Within Groups	586.19	75	7.81		
Total	640.98	77			

Table 4 indicates that the Sig value (.03) is smaller than 0.05, therefore, the differences amongst the groups are substantial at ($p<0.05$). In fact, the EGs outstripped the CG on the reading post-tests.

Table 5

Post-hoc Scheffe test (Multiple Comparison of Reading Comprehension Post-tests)

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bounds	Upper Bounds
MM	CM	-.80	.77	.58	-2.74	1.12
	CG	1.23	.77	.00	-.70	3.16
CM	MM	.80	.77	.58	-1.12	2.74
	CG	2.03[*]	.77	.03	.10	3.97
CG	MM	-1.23	.77	.00	-3.16	.70
	CM	-2.03[*]	.77	.03	-3.97	-.10

The reading comprehension post-test mean outcomes for each group are contrasted in Table 5. Based on the aforementioned data, there is a substantial difference amongst the EGs and CG post-tests. The reading post-test results for both EGs are not significantly different, as this table demonstrates.

Table 6

Descriptive Statistics of Reading Motivation Pre-test

	N	Means	Std. Deviations	Std. Errors	95% Confidence Interval for Means		Minimum	Maximum
					Lower Bounds	Upper Bounds		
MM	26	81.00	16.90	3.31	74.17	87.82	69.00	99.00
CM	26	82.42	16.24	3.18	75.86	88.98	57.00	100.00
CG	26	82.07	16.42	3.22	75.44	88.71	62.00	96.00
Total	78	81.83	16.32	1.84	78.15	85.51	64.00	98.00

The descriptive data for the three groups on the reading motivation pre-test are shown in Table 6. The CG had a mean of 82.07, whereas the MM and CM groups received mean scores of 81.00 and 82.42. This indicates that ahead of the training, all groups were equally motivated to read.

Table 7

Inferential Statistics of Reading Motivation Pre-tests

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.64	2	14.32	.05	.94
Within Groups	20492.19	75	273.22		
Total	20520.83	77			

Table 7 displays the One-way ANOVA test outcomes for the three groups' reading motivation pre-test results. The differences amongst the groups are not meaningful as Sig (.94) is higher than 0.05. In the pre-test for reading motivation, they really had the same results.

Table 8

Descriptive Statistics of Reading Motivation Post-test

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bounds	Upper Bounds		
MM	26	97.88	31.52	6.181	85.15	110.61	72.00	165.00
CM	26	95.50	34.01	6.67	81.76	109.23	77.00	183.00
CG	26	85.57	22.23	4.36	76.59	94.55	78.00	150.00
Total	78	92.98	29.79	3.37	86.27	99.70	83.00	179.00

Table 8 displays the mean scores for the three classes on the post-test measuring reading motivation. The mean score for the CG was 85.57, for the CM group it was 95.50, and for the MM group, it was 97.88. This implies that the groups' outcomes on the post-test measuring reading motivation were different.

Table 9

Inferential Statistics of Reading Motivation Post-tests

	Sum of Square	df	Mean Squares	F	Sig.
Between Groups	2215.48	2	1107.74	1.25	.01
Within Groups	66125.50	75	881.67		
Total	68340.98	77			

According to Table 9, there are substantial differences between the three groups' post-test scores on reading motivation because Sig (.01) is smaller than 0.05. In the post-test of reading motivation, we may say that the EGs outperformed the CG.

Table 10

Post-hoc Scheffe Test (Multiple Comparison of Reading Motivation Post-tests)

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MM	CM	2.38	8.23	.95	-18.18	22.95
	CG	12.30	8.23	.03	-8.25	32.87
CM	MM	-2.38	8.23	.95	-22.95	18.18
	CG	9.92	8.23	.00	-10.64	30.49
CG	MM	-12.30	8.23	.03	-32.87	8.25
	CM	-9.92	8.23	.00	-30.49	10.64

Table 10 compares the average results of each group on the post-tests of reading motivation. The post-test results for both EGs and CG differ significantly, as seen in the above table. This table demonstrates that there was no statistically meaningful variance amongst the CM and MM groups on the reading motivation post-tests. CM and MM had parallel influences on reading motivation in EFL learners; there was no discernible difference between the two strategies.

Table 11

Descriptive Statistics of WTC Pre-tests

	N	Means	Std. Deviations	Std. Errors	95% Confidence Interval for Means		Minimum	Maximum
					Lower Bounds	Upper Bounds		
MM	26	17.30	3.47	.68	15.90	18.71	14.00	26.00
CM	26	18.46	4.15	.81	16.78	20.14	13.00	28.00
CG	26	17.80	3.32	.65	16.46	19.14	16.00	30.00
Total	78	17.85	3.65	.41	17.03	18.68	13.00	27.00

The WTC descriptive data for the three groups are revealed in the table above. All groups' means are almost equal. The CG had a mean score of 17.80, the MM group had a mean score of 17.30, and the CM group had a mean score of 18.46. This indicates that since all groups were homogenous at the start of the therapy, they were all in some way comparable.

Table 12

Inferential Statistics of WTC Pre-tests

	Sum of Squares	df	Mean Squares	F	Sig.
Between Groups	17.41	2	8.70	.64	.52
Within Groups	1010.03	75	13.46		
Total	1027.44	77			

A One-Way ANOVA test was used in Table 12 to see whether there were any possible significant differences among the pre-test findings of the three groups. The difference between the sample groups' means is not statistically meaningful since the Sig level (.52) is more than 0.05 as the

standard to put means to the test. Indeed, on the WTC pre-tests, both EGs and CG performed equally well.

Table 13

Descriptive Statistics of WTC Post-test

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
MM	26	35.03	10.71	2.10	30.71	39.36	17.00	54.00
CM	26	36.46	11.23	2.20	31.92	40.99	15.00	58.00
CG	26	20.23	8.47	1.66	16.80	23.65	18.00	50.00
Total	78	30.57	12.49	1.41	27.75	33.39	20.00	55.00

The results of the three control groups, as well as the MM group and the CM group, on the WTC post-tests are depicted in Table 13 using descriptive statistics. In actuality, the CG, CM group, and MM groups all had mean scores of 20.23, 36.46, and 35.03, respectively. This suggests that on the WTC post-test, the three groups mentioned above each had a distinct performance.

Table 14

Inferential Statistics of WTC Post-tests

	Sum of Square	Df	Mean Squares	F	Sig.
Between Groups	4201.00	2	2100.50	20.14	.00
Within Groups	7820.03	75	104.26		
Total	12021.03	77			

According to Table 14, the Sig value (.00) is smaller than 0.05, signifying that there is a substantial difference between the experimental and control groups. In the WTC post-tests, the EGs outstripped the CG.

Table 15

Post-hoc Scheffe test (Multiple Comparison of WTC Post-tests)

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
MM	CM	-1.42	2.83	.88	-8.49	5.64
	CG	14.80*	2.83	.00	7.73	21.88
CM	MM	1.42	2.83	.88	-5.64	8.49
	CG	16.23*	2.83	.00	9.15	23.30
CG	MM	-14.80*	2.83	.00	-21.88	-7.73
	CM	-16.23*	2.83	.00	-23.30	-9.15

The mean scores on the WTC post-tests for each group are contrasted in Table 15. As this table shows, there was a substantial difference amongst the conditions, P 0.05. This signifies that there is a meaningful difference between the post-test results of the two experimental groups and the results of the control group. Also, this data demonstrates that there is no statistically substantial difference between the CM and MM groups' WTC post-test results (P>0.05).

In short, the results gained in this study indicate that both CM and MM techniques generated equal effects on developing Iranian EFL students' reading motivation, reading comprehension, and WTC. In addition, the findings show that both EGs outperformed the CG on the three post-tests reading motivation, reading comprehension, and WTC.

5. Discussion, Conclusion, and Implication

The findings of the One-Way ANOVA test that the researchers utilized to address the research questions revealed that the EGs who got training using CM and MM strategies outstripped the CG in terms of reading comprehension, reading motivation, and WTC. According to the statistical findings, the approaches used in the current study helped the EGs improve their reading motivation, comprehension, and WTC.

Our results are endorsed by Mousapour Negari and Talebinezhad (2009) who demonstrated the efficacy of CM as a learning approach to EFL students' self-regulation. Our results also corroborate Thuy Trang's (2017) research which showed that CM improves EFL students' reading comprehension. Our findings are also consistent with Alice Chen and Hwang's (2019) certification of the efficacy of concept-based technique on the academic success, critical thinking ability, and speaking anxiety of EFL students.

Our findings are consistent with those of Alwadi and Ismail (2019) who examined the efficiency of the MM technique in improving the speaking abilities of EFL primary school children. Their findings pertain to the beneficial impacts of the MM technique in the current investigation. They discovered that the MM method, which inspired kids, worked well with EFL primary school children. The present findings are also along with those of Alqasham and Al-Ahdal (2021) who claimed that using MM as an interactive brainstorming tool helped EFL learners improve their writing skills. Wannas et al. (2022) who demonstrated how the MM approach favorably impacted the acquisition of ESP vocabulary, further attest to the outcomes. Our findings are also consistent with those of Jiang (2020), Nasution (2020), and Wang (2019) who confirmed the significance of the MM technique in the advancement of English language acquisition.

The beneficial impacts of CM on the pupils' reading skills in this investigation might have a number of causes, according to various theories. First of all, students can utilize a variety of learning techniques to build concept maps, including recognizing key concepts and details, connecting textual material to prior knowledge, and summarizing information into concept maps. In other words, it is probable that learners gained a basic understanding of the reading material and learnt about the connections amongst concepts in the text during CM. The learners' comprehension of the text improved as a result of their increased comprehension of the connection, which helped them better read text messages (Thuy Trang, 2017).

Second, in accordance with Ausubel's (1968) theory of learning, meaningful learning occurs as a process in which students must decide how to connect new material to knowledge that already

exists in their cognitive processes. The CM methodology described in this study is consistent with the idea that emphasizes the importance of students' active participation in their education. Using concept maps might assist readers in drawing on past knowledge or background information as they read (Novak & Caas, 2008). Identifying the core idea, key ideas, and how they relate to the text, then arranging them into a CM helps students to dynamically take part in learning (Khodadady & Ghanizadeh, 2011). As a result, as compared to the CG, the EG performed better in reading thanks to this active participation.

The fact that the MM technique may give pupils a variety of possibilities to learn a language is what we can credit for the favorable impacts of the approach. It also takes into account the various learning styles of the students in the classes (Buran & Filyukov, 2015). Pupils may turn textual explanations into pictorial representations, making it easier for visual students to remember and comprehend the specifics of the course. Rational students favor the informational patterns that a mind map enables. Also, social learners might profit from the necessity of teamwork with their peers during talks included in MM activities (Luangkrajang, 2022).

MM also has a favorable impact on pupils' comprehension of English. Also, it enhances the abilities needed for active learning in kids. It is simple to include these methods in English classrooms, and both students and teachers may gain a lot from doing so. Moreover, using MM exercises in learning contexts encourages students to feel like they own their information. With professors acting as the class facilitator and coordinators, this turns students into active learners (Buran & Filyukov, 2015).

The other justification for the gained results can be referred to as the advantages of the CM and MM techniques. They can provide permanence; they are enjoyable; they can organize systematic learning. The main reason for having these views might be the colors, visuals, and keywords applied in the mind-mapping technique rather than the classical texts, and also might be that EFL students enjoy learning settings based on such techniques. Consequently, mind maps which were utilized by teachers at the outset and the end of the course can assist students to see what they create in their minds. Furthermore, these techniques can be beneficial in terms of teachers' comparing the mind-maps of the students, identification of misconceptions and compensation for students' lack of knowledge, and systematic organization of learning.

It can be said that the approaches investigated in this study had a good influence on the reading motivation, comprehension, and WTC of EFL students. In conclusion, using mind maps in English language education can help students better understand the language topics being trained in classes while also encouraging them to be active students, take responsibility for their learning, and develop other crucial skills. Mind maps help students focus on the important vocabulary and ideas of the course by forcing them to plan, organize, create, and collaborate with their peers. They are a proven technique for cognitive learning in English classes (Buzan, 2017; Sarani & Malmir, 2019). Such a cognitive exercise may be carried out by a learner alone, in a couple, or in a group, maximizing their social and cognitive abilities (Casco, 2009).

The outcomes of this survey show that concept maps might be useful for achieving educational goals. When the student has the freedom to speak what they want without being subject to constraints that might prevent involvement, meaningful learning occurs. The results of this study show that CM and MM approaches generate a favorable influence on EFL learners' reading motivation and comprehension. The outcomes also show that the use of CM and MM strategies in reading classes led to a rise in the learners' WTC.

The participating learners saw the advantages of CM and MM approaches in their ability to quickly and accurately summarize information from reading texts, increase reading interest, draw on past knowledge to create new concepts and enhance information retention. The outcomes of this study apply to both students and teachers. By adopting CM and MM approaches in their English studies, students optimize their learning, which makes them feel more autonomous and responsible for their own learning. By teaching their students the CM and MM strategies, instructors may assist their pupils in developing their self-regulation in language acquisition because these approaches are simple for the students to adopt.

The study's conclusions have some pedagogical ramifications for the use of CM and MM methods in the instruction of reading comprehension. First, CM and MM approaches have a beneficial impact on learners' motivation which is more likely to inspire them to participate actively and dynamically in their learning activities. In order to aid more pupils in enhancing their reading comprehension, CM and MM strategies must be taken into account for use in learning and teaching in a wider context. Lastly, kids are eager to apply this learning technique more frequently to develop their higher-order thinking capacity for long-term academic achievement if teachers strive to support their learners' reading skills and willingness to learn English.

This study also makes several recommendations for the execution of CM and MM techniques regarding students' learning of reading comprehension. These suggestions are based on the learners' perceptions of the potential problems and recommendations they supplied for further application of these techniques. As a consequence of the current study's recommendations for concept map construction, teachers should carefully plan and clearly explain to students how to use concept and mind maps in their reading lessons. Another strategy to advance these learning processes is to provide kids with enough time during their reading classes to create ideas and mind maps. In the end, constructive application of concept and mind maps concerning reading topics, text length, and coverage may enable learners to learn more successfully.

This study suffers from some limitations such as excluding the female students from the participants. Including only 78 students as the research participants is the other limitation of this study. The researchers could collect only quantitative data to answer the questions; the lack of qualitative data can be regarded as the other research limitation. The inclusion of only participants between the ages of 17 and 27 is another limitation in this research.

The present study reveals that CM and MM are helpful to Iranian EFL learners; however, there are still certain areas that require more research. The effectiveness of CM and MM for

students with elementary and advanced English proficiency has to be examined concerning the students' level. Also, it could be interesting to investigate how CM and MM approaches affect many other abilities and sub-skills, like speaking, listening, grammar, vocabulary, etc. To obtain more thorough and reliable findings, investigations using the mixed-method and triangulation method on CM and MM approaches are also advised.

List of Abbreviations:

MM: mind-mapping

CM: concept-mapping

WTC: willingness to communicate

CG: control group

EG: Experimental group

OQPT: Oxford Quick Placement Test

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