Utilizing Electronic Mind Maps to Trigger EFL Teachers' Creativity

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Abstract. The emergence of technology in the fast-paced life of to-day has changed the nature of education, particularly influencing the ways of teaching and learning new languages. This study investigated the effects of utilizing the electronic mind maps on the creativity of Iranian EFL teachers. Determining the attitudes and beliefs of Iranian EFL teachers toward utilizing electronic mind maps was another aim of the study. The data were collected from 44 Iranian EFL teachers using the post-test only control group design. They were equally divided into two groups of experimental and control. The treatment included an electronic mind map software to present the content of instruction in comparison to the conventional teaching used in the control group. After 16 sessions, a one-phase post-test including the English Language Teacher Creativity Scale (ELTCS) and a series of interviews were used. The findings revealed that utilizing electronic mind maps increased the creativity of teachers in comparison to the ones who used conventional

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method. In addition, the majority of participants had positive attitudes towards electronic mind maps and regarded them as creativity-enhancing tools. It was concluded that utilizing electronic mind maps might be regarded as an up-to-date, innovative, and useful instrument for teachers, educators, and researchers for aiding idea generation and divergent thinking processes.

Keywords: Conventional teaching, creativity, EFL teachers, electronic mind maps

1. Introduction

Creativity is one of the essential learning abilities of the 21st century. The study of creativity has been of great importance to educators in general and practitioners and language instruction, in particular. According to Richards (2013), creativity is a long-life capacity that leads to enhancing the quality of education in various ways. The essential role of creativity as an ability to think at a higher level in promoting the quality of education is irrefutable. Cimermanova (2015) claims that it is possible to teach and grow creativity. Rinkevich (2011) confirms the important roles of teachers in promoting creativity. He points out that individuals in their environment are greatly affected by the cognitive growth of teachers regardless of whether they are in pre-school age or even later in school. He noted that professional teacher education leads to creativity in teaching.

Teaching may be called creative when a teacher in some novel or special way incorporates existing knowledge or develops new processes to cultivate cognition to get useful results. This may be prepared or improvised as a response to the demands of the learning context prior to the teaching act (Csikszentmihalyi, 1996). Most of the time developing creativity among students is seen as an extra responsibility of teaching (Beghetto, 2007). Thus, researchers shed light on the absence of creativity in schools and its perceived value among people and termed it as 'Creative Gap' (Makel, 2009). EFL classes have been considered 'the nest of creativity' which motivates EFL learners to take risks and use the new language by using creativity in a joyful way (Piasecka, 2018). It is recommended by some scholars (Heathfield, 2015; Wright, 2015) that

a supportive environment is needed to promote the creativity of EFL learners. In addition, it is necessary on the side of EFL teachers to know what is creativity and how they can encourage learners to be creative ones whether through creative thinking or other strategies (Newton & Beverton, 2012).

Since creative learners need teachers who are creative, it is essential to pay special attention to the field of teachers' creativity in order to be more effective in enacting strategies in line with the current thinking about learning. In addition, in educational environments, encouraging and fostering innovation is also set as a goal. To promote many facets of creativity that seem to be a contentious issue, a variety of approaches and techniques may be needed, that one of them is mind map. Mind maps are tools that encourage thinking and help incorporate ideas and knowledge, and they are also instruments of thinking that visualize concepts (Buzan & Buzan, 1996). Mind maps are types of radiant thinking presentation, using lines, colors, characters, numbers, symbols, graphics, images, or keywords. The learned concept can be linked, incorporated, visualized, and then brain potential evoked. There is a major increase in one's focus, coordination capacity, logic, reasoning, thought, analyzing, creativity, and memory through mind maps. Thoughts while drawing are evoked; if people are taught to use these non-verbal symbols to think and to be equipped with this power, creativity, understanding, and ability to solve problems will be increased (Wang, et al., 2010).

Nowadays, information technologies are widely developed and distributed. Thus, electronic mind maps have become more popular. Papushina, et al. (2016) revealed that different software strongly supports the development of electronic mind map processes, but little is known about this software application for educational needs. Electronic mind maps are more effective and appealing than conventional ones, as they rely on the use of professionally fast and specialized software for computers that include pictures, colors, and sketches (Tungprapa, 2015).

It is assumed that one of the problematic situations of modern education is that teachers are mostly dependent on the books and conventional methods and materials where students are interested in technology and screen materials (Melnyk, et al., 2020). However, Richards (2013) men-

tions that the use of technology is one of the characteristics of creative teachers. He believes creative use of technology in the classroom will help teachers' and students' creation, problem-solving, risk-taking, and divergent thinking. The interest in conducting this study was based on the critical situation concerning the lack of required technology-based environment and appropriate software to use the potentials of electronic mind maps in developing EFL teachers' creativity. Furthermore, to the best of researchers' knowledge, there is no research on the topic of promoting teachers' creativity in EFL classrooms via electronic mind maps in the Iranian context. This study contributed to investigate the effects of using electronic mind maps on enhancing the creativity of Iranian EFL teachers. Moreover, teachers' attitudes toward using electronic mind maps in their classes were determined.

2. Literature Review

From the theoretical point of view, this study followed the Theory of Reasoned Action (TRA) which aims to find an explanation for the relationship between an individual's behavior and his or her action. Related to this theory, this study sought to find possible changes in the teachers' creativity before and after using electronic mind map software. Another theory of the study was the Theory of Planned Behavior (TPB) which states that an individual's behavior is associated with his or her beliefs. As the second objective in this study, the attitudes and beliefs of EFL teachers toward using electronic mind maps were investigated to know their actions and behavior in the future in terms of using or ignoring the use of electronic mind maps.

Cognitivism, which gained recognition in the 1950s, is a large theoretical framework for the human mind's comprehension. Cognitive theories take into account learning an inner conceptual scheme of information that involves the reminder of stored data. The emphasis is on how the brain obtains, constructs, and processes data (Schunk, 1996). This approach can be practiced within the classroom by using visual aids, mind mapping software, and rehearsals, along with mnemonics to help students store, process, and recall knowledge. The purpose of instruction is

to improve the mental conduct of the student. According to this strategy, the task of the teacher is not to be the sole source of data, but instead to attract and retain the attention of learners while teaching them strategies that facilitate their learning (Zhou, 2013).

Learning is based on finding the core concepts, understanding the relationships between them and creating various links between stimulus, and response and each learner possesses a particular sequence of learning (Ausubel, 1968). The level of success in the process of learning is dependent on the number of cognitive activities initiated by the brain of the learner toward making meaningful and logical relationships about the new material in the memory (Al Zghoul & Abdullah, 2015). The mind mapping technique is almost based on the way that the brain treats new information (Siriphanic & Laohawiriyano, 2010). Brain cells store new information by creating different links and sub-links between the main subject and prior knowledge which is the closest in meaning to the main subject. It is mentioned that this process which is proved by science is the basis of learning theory.

A mind map is a hierarchical representation of some keywords which helps the brain make meaning out of various definitions, concepts, and relationship (Weideman & Kritzinger, 2003). According to Wang and Dostl (2018), Buzan started to make notes in the 1960s as an accessible method for learners to memorize. Buzan (1972) introduced the mind map as a tool to provide connections between different concepts based on meaning and logic. The structure of a mind map is based on different networks that are shaped in a non-linear way. By using mind maps both left and right brain hemispheres are engaged in the function processing and integrated as a single process unit (Buzan & Buzan, 2002). Practor (2002) mentioned that the mind map is both a learning technique and an alternative note-taking strategy.

Mind maps, according to Li (2010), are proved to have a positive influence on the accomplishments of learners and are an important tool for learning not just for learners but also for teachers. They are used in a broader sense of learning, including note-taking, critical thinking, and decision-making. Mind maps also have a huge effect on knowledge building by growing learners' cognitive capacity by extending their un-

derstanding of L2. Brinkmann (2003) described several benefits of using mind maps. They help students connect, organize, memorize, and remember data. In summarizing lessons, they can also be rather advantageous. They also help teachers incorporate new subjects and to explain similarities between concepts and subjects. Fiktorius (2013) examined the effectiveness of using mind maps for both EFL teachers and EFL learners. The results revealed that the critical and required qualities in teaching and learning both for teachers and learners were increased by using mind maps in their EFL classes.

Bukhari (2016) reviewed and discussed the conventional methods used by Saudi intermediate learners in teaching writing and identified suitable mind mapping techniques along with an implementation method to develop writing skills. Kurniawan, et al. (2020) examined the impact of collaborative mind mapping on developing students' writing skills. Enhancing the student's ability in writing descriptive text through collaborative mind mapping was the purpose of their study. The results showed that using collaborative mind mapping enhances the student's competence in writing because it leads to learning excessive vocabulary from reading a passage and giving feedback from the teacher. In Iranian context, Shakoori, et al. (2017) investigated the impact of a mind map among EFL learners as a graphical tool for writing achievement. Results showed that the use of mind maps did affect the writing of the experimental community.

The advent of technology has made different computer software accessible for all people, especially students in different fields. It has also attracted the attention of scholars. In the area of language teaching, researchers have tried to investigate the influence of various mind mapping software on different fields of language learning. Al-Jarf (2010) illustrated in her study how mind mapping software is used to help EFL freshman students understand, retain, apply, and relate terms that share the same root or base. Kim and Kim (2012) indicated that the use of digital mind maps could improve vocabulary learning outcomes of students in elementary school and also it causes learning satisfaction. Alwattar and Al-Balhan (2018) also explained the importance of developing vocabulary skills using electronic mind-mapping strategies. In terms

of organization, language usage, vocabulary, and mechanics, Sebit and Yildiz (2020) investigated the effects of computerized mind maps on the essays of EFL students the authors concluded that learners had positive attitudes toward using electronic mind maps in the form of EFL as a pre-writing practice.

In the Iranian context, Bahadori and Gorjian (2016) concluded that the use of mind mapping software strengthened the interest of students and encouraged them to pursue the modern way of teaching reading vocabulary. Salehi and Soola (2018) checked the possible effectiveness of mind maps on learning idioms by 60 females Iranian EFL learners. The findings demonstrated positive effects on utilizing mind maps to learn idioms. In a study by Naghmeh-Abbaspour, et al. (2019), Mindomo software was utilized in order to examine the effect of using a computerized version of mind maps on the logical development of Iranian EFL learners' writing. The results indicated that the application of Mindomo in teaching writing could enhance the learners' abilities to develop their writings.

Reviewing the related literature, an overall lack of research on teacher's creativity in general; as far as the researchers know, no studies have been conducted to investigate the impacts of utilizing electronic mind maps on enhancing the creativity of Iranian EFL teachers. Accordingly, this study was an attempt to investigate how the creativity of EFL teachers might be enhanced by using electronic mind maps. Furthermore, the attitudes of EFL teachers toward using electronic mind maps were analyzed. To address these purposes, this study sought to find answers to the following research questions.

1. Does utilizing electronic mind maps enhance the creativity of Iranian EFL teachers?

2. What are the attitudes of Iranian EFL teachers toward utilizing electronic mind maps in their teaching?

3. Methodology

The following sections elaborate on the design, setting, participants, instruments, and data collection and analysis procedures of the study in detail.

3.1. Design and context of the study

To conduct the current study, the quantitative research paradigm was employed. To find the impact of the independent variable on the dependent variable, the experimental design was used. Due to some limitations in conducting a pre-test, the present study employed a post-test only control group design. In this type of study, the participants are randomly distributed into two groups namely the experimental group and the control group. The experimental group receives treatment and both groups are measured according to the required variables afterward. To make sure about the validity of this study, some variables such as teaching experience and the scores of participants in teaching obtained from Iran's Ministry of Education (calculated based on different factors) were checked to be the same as far as possible. At the end of the program, a structured interview was used. This study was conducted from September of 2019 to December of 2019 in Isfahan Teachers' Research Center (ITRC), Isfahan, Iran.

3.2. Participants

Among 68 Iranian EFL high school teachers both males and females, 44 were selected to participate in this study based on purposive sampling. All teachers had a Bachelor's degree in TEFL (Teaching English As a Foreign Language) and they had 10 years of teaching experience They have registered for different obligatory in-service courses at Isfahan Teachers' Research Center (ITRC). The selected 44 participants were randomly assigned into two groups namely the experimental group (22 participants) and the control group (22 participants). The participants in the experimental group were taught how to use electronic mind map software to prepare their content of teaching. Table 1 shows the demographic characteristics of the participants.

Table 1: Demographic Characteristics of the Participants

No. of EFL Teachers	44
Gender	20 Males and 24 Females
Native Language	Persian
Experience in Teaching	At least 10 Years
Selection Context	Isfahan Teachers' Research Center (ITRC)
Major	TEFL
Academic Year	2019-2020

It should be noted that participation in this research was voluntary and the participants had not been forced whether by ITRC or the researchers to participate in the study. All of them were informed of the participation, and they were aware that being a participant in this study did not have any extra points for them in the Teachers Rating Plan. Moreover, in order to protect the confidentiality of the participants, all personally identifiable information was kept secret. The necessary and required permissions for conducting the study were obtained from the heads of the Isfahan Teachers' Research Center before approaching the selected participants.

3.3. Instruments

The instruments employed to collect data were based on of two types. First, English Language Teacher Creativity Scale (ELTCS)as a post-test was administered to both groups to examine the effect of using the electronic mind maps on teachers' creativity. Second, a structured interview was used to elaborate on the teachers' attitudes and beliefs toward using electronic mind maps in the classrooms. The following sections explain these two instruments in detail in addition to Mind Meister as an electronic mind map which was used in the experimental group.

3.3.1 English language teacher creativity scale (ELTCS)

As measuring creativity is sensitive to many intervening variables such as respondents' context, society, and culture, it was more rationale to select the required scale from a study conducted in the Iranian setting of EFL. English language teacher creativity scale by Pishghadam, et al. (2012) was selected to be used for this study. It consists of 62 multiple choice items across seven different categories ranging from 'never' to 'always' based on a five-point Likert scale. The categories include originality and elaboration, fluency and flexibility, the person (teacher), press (environment) and materials, motivation, independent learning (autonomy), and brainstorming. As some of the wordings changed by the researchers to make the questionnaire in line with the research questions, it was validated again and its reliability was double-checked which is discussed in the results section. The composite and content validities were checked according to SEM (Structural Equation Modeling) and

PCA (Principal Component Analysis) and content validity was checked
by a panel of associate professors in teaching language. The character-
istics of the ELTCS are presented in Table 2.

Table 2: Characteristics of the ELTCS

Cat	Name	N of Items	Score	Type of Scale	Range
1	Originality and elaboration	8	8-40	5-point Likert	Never-
2	Fluency and flexibility	12	12-60	scale	Always
3	Person	10	10-50		
4	Press and materials	8	8-40		
5	Motivation	10	10-50		
6	Autonomy	8	8-50		
7	Brainstorming	7	7-35		
	Total	63	63-315		

To make sure about the reliability of the ELTCS questionnaire, a pilot
test was conducted for 12 EFL teachers in a language institute which
the related results will be discussed later (Table 3). The results of the
pilot test indicated the total value of Internal Consistency ($\alpha = .887$).

3.3.2 Interview

A structured interview was used to collect the teachers' attitudes to-
wards using electronic mind maps. In this interview, three questions were
asked to encourage the respondents to express their thoughts deeply and
critically (see Appendix A). Structured interview, formal interview, or
researcher-administered survey consists of a set of fixed questions (struc-
tured and close-ended questions) ordered in a standardized or rule-based
way. The advantages of this type of interview are first easy to replicate
and quantify and second, quick conduction. The limitations include first,
new questions cannot be asked impromptu, and second, lack of detail as
only closed questions are asked.

3.3.3. Mind meister

Mind Meister is the mind mapping software based on multi-platforms
which makes it easy for researchers, teachers, and learners to visualize
their thought through electronic mind maps and make them accessible
via cloud or in a standalone file. This software is developed and released
for different platforms such as Windows, Android, iOS, and Web to
makes it handy to use across different situations. Mind Meister was used
in this study as an electronic mind map in the experimental group.

3.4. Data collection procedure

As far as the study was an attempt to examine the effects of electronic mind maps on teacher's creativity, the selected 44 participants (out of 68) were randomly divided into the experimental group (22 participants) and the control group (22 participants). Twenty-two EFL teachers in the experimental group learned how to use Mind Meister software to present their content of the syllabus via an electronic mind map. The researchers asked EFL teachers in the control group to teach English in their own style. After exposure to the treatment for every EFL teacher in the experimental group (16 sessions each for 90 minutes of teaching English via electronic mind maps through Mind Meister Software) a one-phase post-test was conducted. All of the participants were provided with oral explanations of the purpose of the study and how to fill the items in the questionnaire. Normally, it took around 30 minutes for the questionnaire to be filled in. Ten participants in the experimental group were chosen randomly to participate in an interview to check the EFL teachers' attitudes and beliefs toward using electronic mind maps. Participants answered to three questions in 10-12 minutes and their answers were recorded.

3.5. Data analysis procedure

In order to analyze the data obtained from the questionnaires completed, the Statistical Package for the Social Sciences (SPSS v. 26) was used. First, the normality assumption was checked for the scores which were collected from the ELTCS questionnaire. For the first research question, the descriptive statistics including frequency, range, mean, standard deviation, and percentage were calculated. After that, a t-test was used to check whether there was any significant difference between the scores of the experimental group and the control group to check if utilizing the electronic mind map affects the creativity of Iranian EFL teachers or not. For the second research question, content analysis was performed to make sure about the results derived from the ELTCS questionnaire.

4. Results

A pilot test of the ELTCS was conducted for 12 EFL teachers in a language institute to make sure about its reliability. The total value of the reliability estimates and its values across each category is shown in Table 3.

Table 3: Reliability Statistics of the ELTCS

Category	N of Items	Valid Participants	Cronbach's Alpha
Originality and elaboration	8	12	.814
Fluency and flexibility	12	12	.892
Person	10	12	.914
Press and materials	8	12	.894
Motivation	10	12	.946
Autonomy	8	12	.935
Brainstorming	7	12	.811
Total	63	12	.887

According to Table 3, the results of the pilot test show the total value of Internal Consistency ($\alpha = .887$). As Jasrai (2020) proposes the value of coefficient alpha ($0.8 \leqslant \alpha$) is an indicator of a very good internal validity.

To check the normality, two procedures were followed. First of all, the descriptive statistics, and then qualities of kurtosis and skewness ratios were computed. Second, the Kolmogorov-Smirnov (K-S Test) and Shapiro-Wilk tests were computed. Table 4 shows the descriptive statistics of the ELTCS scores.

Table 4: Descriptive Statistics of the ELTCS Across Groups

	N	Min	Max	Range	Mean	SD	Kurtosis	Skewness
ELTCS Scores	44	188	306	118	242.75	43.701	-.854	.030

According to the values of skewness ratio and kurtosis ratio in Table 4, the dispersion for the ELTCS scores appeared normal (Cohen, 2008). Furthermore, from another theoretical aspect, George and Mallery

(2010) mentioned that if the qualities of skewness and kurtosis are between -2.00 to +2.00 the distribution is normal. Again, the results support this theory. The mean score shows high creativity scores in total (experimental group and control group), and the range value shows a high distance between the minimum and maximum scores. To make sure about the normality assumption, Kolmogorov-Smirnov and Shapiro-Wilk tests were calculated. Ghasemi and Zahediasl (2012) stated that the Shapiro-Wilk test is more appropriate and powerful to check the normality assumptions for studies with a low population in comparison to the Kolmogorov-Smirnov test which is more suitable for studies with a high population.

Table 5: Kolmogorov-Smirnov and Shapiro-Wilk for ELTCS Scores

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ELTCS Scores	.218	44	.112	.829	44	.128

a. Lilliefors Significance Correction

As shown in Table 5, the significant values of ELTCS scores are above the critical point (0.05), thus, the assumption of normality is met for the ELTCS scores (Tabachnick, Fidell, & Ullman, 2007). Table 4, showed the total descriptive statistics for two groups, experimental and control groups together. To analyze the ELTCS scores related to each group, the experimental group and the control group, the descriptive statistics across two groups were calculated. Table 6, shows the descriptive statistics for both the experimental group and control group based on their obtained ELTCS scores.

Table 6: Groups Statistics of The ELTCS Scores Across Experimental and Control Group

ELTCS Scores	N	Mean	St. Deviation	Min	Max
Experimental Group	22	284.68	11.428	268	306
Control Group	22	200.81	9.757	188	218

As seen in Table 6, the mean score of the experimental group was higher

than the control group. Thus, the experimental group outperformed the control group in terms of ELTCS scores. It has been revealed that there is a difference between these two groups in terms of their performance on the ELTCS questionnaire. To make sure that the difference between them is significant, an independent-samples t-test was performed to compare these two groups.

Table 7: Independent-Samples T-Test Between Exp. and Cont. Groups Based on ELTCS Scores

F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	St. Error	Lower	Upper
.311	.580	26.180	42	.000	83.871	3.204	77.406	90.337
		26.180	40.990	.000	83.871	3.204	77.401	90341

As presented in Table 7, the results of Levene's test show that the variances of the two groups are assumed to be equal, Thus, the standard t-test (equal variances assumed) result was used. The finding of the independent t-test was significant, indicating that there is a significant difference between the experimental group and the control group in terms of ELTCS scores. It can be concluded that using electronic mind maps by MindMeister software increased the creativity scores of EFL teachers in the experimental group. Furthermore, the difference between the ELTCS scores of the experimental and the control groups was significant and the experimental group outperformed the control group as they obtained higher ELTCS scores.

The second research question of this study was investigating the EFL teachers' attitudes and beliefs toward using Electronic Mind Maps by interviewing to elicit the related data. To this end, 10 EFL teachers in the experimental group were randomly selected to participate in an interview. The data were first recorded, then coded, and finally categorized. The analysis of the data obtained, according to the first question of the interview about EFL teachers' view toward the impact of the electronic mind map on their creativity, indicated that most of the teachers (98%) believed that using electronic mind map could increase their creativity in teaching. They claimed that using electronic mind maps helped them make creative plans, solve problems in the original

and new ways, and prepare creatively the presentations. All the participants were impressed by the results of their work, although for the majority of teachers creating electronic mind maps was their first experience. For example, As Teacher A, who was a teacher of 10 years, mentioned the positive impacts of using electronic mind maps. "Using electronic mind maps help me enhance my creativity in brainstorming and make presentations". Teacher B, who had 11 years of teaching experiences, said "electronic mind maps stimulated creative thinking and generated new ideas in my class." Teacher C, with 10 years of experiences stated "by using electronic mind maps, I could connect all the details together, visualize and classify the information creatively." She added "analyzing and collecting the data, exchanging the information, and originally understanding the learning material were the results of using electronic mind maps for me." she claimed that by using electronic mind maps, she was able to use the information for creative collaborative work in the class.

According to the second question of interview about the benefits of using electronic mind maps, the most frequently mentioned benefits were labeled into four different categories. The first category (P = 34.50%) was about 'getting EFL teachers focused'. Most of the EFL teachers mentioned that because the relationships among texts and pictures in the layout of mind maps are based on a hypernym into hyponym form, after using electronic mind maps, could find links between their ideas and focus on different thoughts at the same time. It was mentioned that because electronic mind maps are able to show depth, having a 3D perspective helps them to acquire more information in a shorter time.

The second most frequently mentioned benefit category (P = 31.70%) focused on the 'wide adaptability' of the use of electronic mind maps. The EFL teachers stated that they were very satisfied with the dynamic and fast-changing structure of the electronic mind maps. Using electronic mind maps, helped them to quickly prepare exams out of summaries that they provided to present in their classes. The third most frequently mentioned benefit (P = 19.60%) was about simple and easy procedure to create mind maps just by some clicks. They mentioned that electronic mind maps can be provided through the easy setup of layouts,

user-friendly configuration menus, and stand-alone outputs that can be used everywhere.

The final most frequent benefit category which was mentioned by EFL teachers (P = 14.20%) was about enhanced memory of EFL teachers. The EFL teachers stated that after using electronic-mind maps, their eidetic memory or photographic memory was improved to a significant level. They were really satisfied by the way their brains try to make meanings out of symbols and images. This process of making meaning helped them to memorize critical information easier and retrieve them in a short time.

The analysis of the data obtained, according to the third question of the interview about the limitations of using electronic mind maps, indicated that the most frequently mentioned limitations were labeled into three various categories. It should be mentioned that almost most of the limitations were somehow derived from personal ideas and perspectives. The first category in the limitations (P = 42.80%) was about difficulties in structuring the hierarchical forms of mind map layouts. Most EFL teachers were in trouble in making appropriate hierarchical layouts for mind maps which were meaningful for themselves and students. Providing a meaningful link between different relationships in mind maps with learners' knowledge and understanding was a challenge for most of them.

The second most frequently mentioned limitation category (P = 31.90%) focused on the 'lack of required equipment in most of the public schools in Iran'. The EFL teachers were aware of the huge improvements in teaching and learning, they observed through teaching via electronic mind maps but on the other hand, they were not able to use this method in most of the public schools in Isfahan, Iran. The final limitation category was about 'some difficulties in running the software and lack of the required knowledge of computer science'. Electronic mind maps require EFL teachers to have a basic level of knowledge about computers' operating systems such as Windows and Linux. Most of the EFL teachers admitted that the International Computer Driving License (ICDL) should be obtained as a requirement for teaching.

5. Discussion

Most of the studies in this field have analyzed the effects of traditional mind maps on different qualities of EFL learners. Thus, the discussion of the results was limited. The first research question of this study was to check whether utilizing electronic mind maps affect the creativity of Iranian EFL teachers or not. It was shown that using electronic mind maps increased the creativity of EFL teachers. Furthermore, the findings revealed that there was a significant difference between EFL teachers who use electronic mind maps and those who use the traditional way of teaching in terms of their ELTCS Scores.

The second research question of this study was posed to check the attitudes of teachers who experienced using this method in their classes (some participants of the experimental group) toward using electronic mind maps. Based on the analysis, the attitudes of teachers towards using electronic mind maps and their effects on their creativities were analyzed. The majority of the EFL teachers had positive attitudes toward electronic mind maps and regarded them as beneficial tools for enhancing their creativity in classrooms. The EFL teachers pointed out some advantages consisted of getting EFL teachers focused on wide adaptability, simple and easy procedure to create mind maps just by some clicks, enhanced memory of EFL teachers. They also mentioned some limitations consisted of difficulties in structuring the hierarchical forms of mind map layouts, lack of required equipment in most of the public schools in Iran and difficulties in running the software, and lack of the required knowledge of computer science.

The results of this study were in line with the study conducted by Sebit and Yildiz (2020) which concluded that learners had positive attitudes toward using computerized mind maps as a pre-writing practice. The results of the current study also supported the findings of the study by Naghmeh-Abbaspour, et al. (2019), in which the results indicated that the application of Mindomo as a mind map software in teaching writing could improve the learners' abilities in writing.

The results of this study were also in line with a study conducted by Fiktorius (2013), in which the effects of using mind maps for both EFL

teachers and EFL learners were investigated. It was revealed that the critical and required qualities in teaching and learning both for teachers and learners were increased by using mind maps in their EFL classes.

6. Conclusion

In light of the findings, it was found that using electronic mind maps increased the creativity of the EFL teachers. Furthermore, the results revealed that EFL teachers who used electronic mind maps outperformed those who used the traditional way of teaching in terms of ELTCS scores. In addition, teachers' attitudes towards the benefits and limitations of using electronic mind maps and their impacts on teachers' creativity were found based on the content analysis. Advantages consisted of getting EFL teachers focused, wide adaptability, simple and easy procedure to create mind maps just by some clicks, and enhanced memory of EFL teachers. Limitations consisted of difficulties in structuring the hierarchical forms of mind map layouts, lack of required equipment in most of the public schools in Iran, and difficulties in running the software, and lack of the required knowledge of computer science. All in all, the majority of the EFL teachers who participated in the study had positive attitudes towards using electronic mind maps and confirmed that using them could enhance their creativity.

The results of this study might have some implications for designers of in-service courses for EFL teachers, policymakers, and EFL teachers. Policymakers need to emphasize the effective role of electronic mind maps and their many advantages for EFL teachers. The designers and developers of EFL teachers' training courses should be aware of the great potential of electronic mind map courses to introduce technology-based approaches in teaching. It is recommended for EFL teachers to consider and investigate the huge positive impacts of using electronic mind maps. Stakeholders of schools, particularly public schools provide the required equipment for EFL teachers to use electronic mind maps for teaching English.

As the COVID-19 pandemic has started in the final phases of this study, for further research, it is an interesting idea to investigate the

effects of electronic mind maps based on E-learning through developing and utilizing related software across Learning Management Systems (LMS) in a vocational context of education such as Massive Open Online Courses (MOOCs), Mobile-Assisted Language Learning (MALL), and Computer-Assisted Language Learning (CALL) on different qualities of EFL teachers such as reflective thinking, critical thinking, and teaching style. In addition, by changing the focus of EFL teachers to ESP teachers, interesting results may emerge. Moreover, changing the design of the study, whether to use a pre-test or finding correlations have huge potentials to be investigated. This study has two limitations. First, the findings are generalizable only to similar contexts and further research might be needed with a large population pool from various teaching contexts to cast clearer light on the roles of the electronic mind map on teacher's creativity. Second, as the teachers' creativity was the focus of this study, the impacts of using electronic mind maps on learners' creativity as well as their attitudes were ignored and future research might need to consider the effects of using electronic mind maps on the creativity of EFL learners.

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Appendix
A Interview Questions

1- Do you think that electronic mind maps could enhance the creativity of the EFL teachers?

2- What are the benefits of using electronic mind maps in the EFL high school classes?

3- What are the limitations of using the electronic mind maps in the class?