

**Original Article**

## Mediating Role of E-mind Mapping in Adopting a Self-Regulated Language Learning Strategy Among Iranian EFL Learners

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### Abstract

One of the affective factors contributing to the EFL learners' learning outcome is their preferred language learning strategy. This study aimed to investigate the possible role of E-mind mapping as a modern node-link teaching technique in adopting a specific self-regulated language learning strategy (SRLLS) among Iranian EFL learners. Based on quasi-experimental research, 64 EFL learners were conveniently selected and randomly divided into two groups, namely, experimental and control groups. The valid and reliable Self-Regulated Foreign Language Learning Strategy Questionnaire was conducted for all of the participants in the pre and post-test but with different item orders. The intervention consisted of 15 sessions each 90 minutes in which E-mind mapping was utilized in the experimental group but conventional teaching was employed in the control group. Descriptive statistics and the t-test was used to analyze the collected data. The results revealed that before conducting the study the most preferred SRLLS among participants were cognitive strategy but after using E-mind mapping techniques, the preferred strategy in the experimental group changed to metacognitive strategy. Also, the Iranian EFL learners' use of meta-effective and meta-sociocultural-interactive strategies, which were previously infrequent, improved. Thus, the results indicated that the E-mind mapping technique was effective in adopting a particular SRLLS among EFL learners. The findings emphasize some successful initiatives to build learners' self-regulated strategies through strategy training incorporated into educational programs and special curriculum designing.

**Keywords:** EFL learning, E-mind mapping, Language learning strategy, Self-Regulated learning

## 1. Introduction

In the field of educational psychology, Self-Regulated Learning (SRL) is a complicated, productive process in which students set learning objectives and then oversee, manage, and control their cognition, motivation, and behavior. Over the last three decades, extensive research on SRL has proved its tremendous impact in enhancing students' academic success and creating proactive learners in a variety of educational and psychological circumstances (Zimmerman, 2013). Through persistent learning techniques, strategic self-regulated learning is becoming increasingly commonly recognized as being at the center of second/foreign language (L2) teaching and learning for the development of self-regulated learners who are autonomous, skilled, and goal-oriented (Oxford, 2017; Zhang et al., 2019). As a result, several academics have claimed that teaching self-regulated, planned learning can lead to improved academic achievements (Gu, 2010; Oxford, 2017). According to Gu (2010, p. 1), "The primary idea underlying language learning strategy research is that learners can take a considerably more active part in directing and managing the learning process with the help of teachers and curriculum, hence maximizing educational objectives."

Buzan (1972) found mind mapping to be a non-linear technique for creating reasonable and relevant connections between concepts. He described the mind mapping procedure as beginning with a picture or word in the center of the paper and then adding some keywords related to the central word. With the advancement of technology, all people, particularly students in distinct disciplines, now have access to various computer applications. It has also piqued the interest of academics. Sharafeeva (2016) believes that it is essential for teachers to plan learning procedures by choosing appropriate educational technologies that are based on the characteristics of the students. His emphasis is on using educational technology to help students improve their mental abilities. Researchers in the field of language instruction have attempted to explore the impact of different mind mapping software on multitudinous aspects of language learning. Understanding, retaining, applying, and relating concepts, which facilitate language development in reading (Merchie et al., 2021), writing (Abrams & Byrd, 2016), grammar (Wang, 2019), and vocabulary (Kim & Kim, 2012), are just a few of the educational benefits of E-mind mapping techniques.

As consumers of the technology era, today's learners are concerned with social networking via online technology, as well as a range of possibilities for self-expression, differentiated instruction, and the negotiation of meaning. This could have influenced their preferred learning strategies. Based on the self-regulated learning (SRL) paradigm, Oxford (2017) rebuilt the initial categorization of language learning strategies. She developed unique viewpoints in strategy research with her Strategic Self-Regulation Model of Language Learning, which filled the gap between language learning strategies theory and self-regulated learning.

Although several intervention studies have found that students may learn strategies to control their learning (e.g., Dignath & Büttner 2008), many issues about how SRL strategies are implemented in real classrooms remain unsolved. Unfortunately, there aren't enough studies looking into how SRL strategy instruction and teaching techniques can help L2 students become self-regulated language learners, particularly in English as a foreign language (EFL) learning in Iran. Following the recent request for more diverse learning methodologies, and based on Oxford's (2017) Strategic Self-Regulation Model of Language Learning (Zhang et al., 2019), this study was conducted for two goals; the primary goal was to map in general the strategies that Iranian EFL learners use frequently in the language learning environment. The secondary goal was to use E-mind mapping techniques as strategic-based instruction to determine its influences on SRLLS adoption among Iranian EFL learners.

## **2. Literature Review**

### **2.1. LLS and SRL Concepts**

The strategic approach to language acquisition has received much interest since Rubin (1975) defined the qualities of effective and successful language learners. Scholars started recognizing, analyzing, and categorizing tactics, which resulted in a diverse statistical framework. The terms linguistic learning strategies, learner strategies, self-regulated learning strategies, strategies, and strategic, according to Oxford (2017), have 33 different definitions. According to Oxford's (1990) widely accepted definition “LLS are acts taken by the learner to make learning easier, shorter, more pleasant, more self-directed, and transferable to different situations” (p. 8). A significant number of classifications have arisen with a vast number of definitions. The six-category strategy

classification of direct (i.e., memory, cognition, and compensation) and indirect (i.e., metacognitive, affective, and social) strategies proposed by Oxford (1990) was broadly acknowledged for many years. Several researchers have noted, however, that the terms used to describe language learning strategies are too broad and unclear and should be defined more specifically (e.g., Dörnyei, 2005). Dörnyei (2005) mentioned according to Oxford's taxonomy, compensatory strategies are more directly tied to language usage than to language learning.

Self-regulation is a concept that comes from the field of educational psychology and has a lengthy history. The topic of self-regulation has been researched from many theoretical viewpoints since 1980. Pintrich (1995) was the first to define self-regulated learning as a proactive and useful process. Students define learning objectives and plan, arrange, and oversee their activities to attain them throughout this procedure. Based on this definition, a significant number of models have been developed. Panadero (2017) looked into the six most popular models, evaluated them, and ranked them. Most SRL models include cognitive, metacognitive, behavioral, motivational, and effective learning characteristics, as well as self-efficacy, self-efficiency, metacognitive and cognitive approaches, motivational and emotional aspects, and learner beliefs, among other variables. Dörnyei (2005) argued that including self-regulated approaches in the language learning process would result in a wider interpretation of the word than the recent definition of LLS. Furthermore, he suggested that self-regulation, rather than language learning approach principles, is the foundation for a more dynamic model.

Because of a lack of theoretical consensus, Oxford (2011) revised her initial idea and included self-regulation theory in her model. According to her strategic self-regulation model, self-regulated learning strategies are deliberate, goal-directed attempts to govern and control the foreign language learning process. These strategies, she saw, are teachable acts that language learners can use to attain their L2 learning objectives. For example, building, accepting, saving, or utilizing information for various purposes, and/or improving their L2 competency and self-efficacy in general.

Gao and Shen (2021) presented findings from a study of Chinese EFL learners' learning techniques in a mobile-technology-assisted setting. In this context-specific case study, Dörnyei's (2005) learning strategy categories served as the analytical and conceptual framework for data collection and analysis. In this study, the participants used the most

metacognitive and commitment control strategies. Metacognitive strategies are more commonly used by students than commitment and environmental control strategies. Satisfaction and mood management strategies were also seen, which are rarely used by Chinese students in a teacher-led language classroom.

The most popular self-regulatory strategies used by Iranian EFL students were discovered by Mahmoodi et al. (2014). Iranian EFL students preferred cognitive and metacognitive SLR strategies such as arranging and changing, self-evaluation, collecting information, and checking. Banisaeid and Huang (2015) found that cognitive and metacognitive techniques were the most commonly used language acquisition strategies among Iranian EFL students, whereas effective strategies were the least commonly employed. Learners used metacognitive self-regulation, time and study environment, and other self-regulated learning strategies more frequently than other self-regulated learning strategies, according to the findings.

## **2.2. E-Mind Mapping Technique**

In the adaptation process, Piaget (1954) believed that learners build meaning in new information by linking the new information and what they have already known. Therefore, it is important to elicit students' pre-knowledge and the new information they have learned during the learning process. Therefore, it is essential to activate students' pre-knowledge to realize their misconceptions or insufficient comprehension. Mind mapping is one of the visual techniques for activating students' pre-knowledge. Acceptance of the constructivist approach to the use of mind mapping requires active learning in which individuals construct knowledge by making sense of what they have learned after evaluating their experience, observations, and logical factors. Mind mapping promotes the engagement and independence of students to share their innovative thought and thus increases their achievement in learning.

Aljaser (2017) demonstrated that two types of mind maps exist; by using paper and pen or on the board, the typical mind maps were manually drawn. The E-mind maps, on the other hand, apply the same steps by using computer software that produces flow branches automatically from the central one. In addition, it is possible to modify or edit ideas by adding images and symbols. E-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.

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 vocabulary. Alwattar and Al-Balhan (2018) also explained the importance of developing vocabulary skills using E-mind-mapping strategies. In a study by Naghmeh-Abbaspour, et al. (2019), the effect of adopting a computerized form of mind mapping techniques on the logical growth of Iranian EFL learners' writing was investigated using Mindomo software. The findings suggested that using Mindomo in the classroom to teach writing could help students improve their writing skills.

In terms of organization, language usage, vocabulary, and mechanics, Sebit and Yildiz (2020) investigated the effects of computerized mind mapping on the essays of EFL students. In terms of content and organization in all essay tasks, the findings indicated that the independent mapping group performed better than the control group. After interviews, the authors concluded that learners had positive attitudes toward using computerized mind mapping in the form of EFL as a pre-writing practice.

Several studies have discovered that learning techniques have a positive impact on conventional language-learning courses (e.g., Ehrman et al, 2003) and that there is a correlation between L2 performance and the use of active SRL (Mezei, 2008). An increasing body of evidence suggests that SRL can improve technology-enhanced learning settings such as digital reading-annotation systems (Chen et al., 2014), mobile learning settings (Zheng et al., 2018), and online collaborative learning environments (Kuo et al., 2015).

Reviewing related literature indicated the effectiveness of the E-mind mapping technique in the field of language learning and teaching. It also illustrated the essential role of self-regulated strategy learning in the EFL learning environment. However, to date, no study was conducted to examine the mediating role of the E-mind mapping technique in adopting special self-regulated language learning strategies (SRLLS) among Iranian EFL learners. To fill this gap this research specifically addresses the following research questions:

1. What kind of self-regulated language learning strategies (SRLLS) do Iranian EFL learners utilize in the learning environment?

2. Does the E-mind mapping technique have any influence on adopting a special self-regulated learning strategy by Iranian EFL learners?

### 3. Methodology

#### 3.1. Design and Context of the Study

To address the research questions, the study adopted the quantitative approach. The quasi-experimental design was used which suits the nature of the research. This study consisted of a pre-test, a post-test, one experimental, and one control group. It was conducted from October 2020 to January of 2021 in a language institute in Isfahan, Iran.

#### 3.2. Participants

Among 81 intermediate EFL students attending English classes at a language institute in Esfahan, Iran, 64 participants were enrolled voluntarily. Thirty were male and 34 female adult EFL learners, whose ages ranged from 24 to 35 years. The adult participants were selected for the study because according to Terracciano et al. (2008) individual personality differences are often persistent during adulthood. Available students passed the placement test which was administered by the selected language institute. The placement test was administered to homogenize the participants' proficiency levels. Then the intermediate students were randomly divided into two groups assigned as the experimental and control groups. Table 1 shows the demographic characteristics of the participants in this study.

Table 1.

*Demographic Background of the Participants*

No. of Students	64 intermediates
Gender	34 Females & 30 Males
Native Language	Persian
Major	Different Majors
Academic Years	2020-2021

Before beginning the experiment, the purposes and procedures of the study were explained to the participants to obtain their agreement to take part in the study. The ethical guidelines required by the selected language institute were also followed. Moreover, to

protect the confidentiality of participants, all personally identifiable information was kept secret.

### 3.3. Instrument

Self-Regulated Foreign Language Learning Strategy Questionnaire (SRFLLSQ) was used as pre-and post-test in this study (see Appendix). SRFLLSQ was designed and validated by Habok and Magyar (2018) based on Oxford's (2017) Strategic Self-Regulation Model. A 34-item questionnaire consisted of five parts: cognitive (6 items), sociocultural-interactive (4 items), metacognitive (8 items), meta-affective (8 items), and meta-sociocultural-interactive (8 items). A five-point Likert scale was used for the students' responses. The scale ranged from 1 (Never or almost never true of me) to 5 (Always or almost always true of me). According to Oxford (2011), cognitive strategies allow learners to build, modify, and use L2 information. Communication, sociocultural circumstances, and identity are all interwoven into sociocultural-interactive strategies. Learners can employ meta strategies to control and manage the application of strategies in the other three dimensions: cognitive, affective, and sociocultural-interactive. For each of the fields, internal consistency reliabilities were computed. Cronbach's alpha and omega coefficients were both acceptable for each of the five factors. Their values on the five subscales ranged between 0.74 and 0.88, indicating satisfactory reliabilities (Habok & Magyar, 2018).

In addition, to make sure about the reliability value in the context of Iran, the SRFLLSQ was piloted for 15 Iranian EFL learners. Table 2 is a representation of the reliability of the piloted SRFLLSQ. The results showed the value of Internal Consistency as ( $\alpha = .911$ ). George and Mallery (2003) stated that, if the value of coefficient alpha is ( $0.9 \leq \alpha$ ), excellent internal validity has been reached.

Table 2.

*Case Processing Summary and Reliability Statistics for the SRFLLSQ*

Cases	N	P%	Cronbach's Alpha	Number of Items
Valid	15	100.0	.911	34
Excluded	0	0		
Total	15	100.0		



### **3.4. Data Collection Procedure**

The permissions to conduct the study was received from the head of the Language Institute, and all of the participants were told that they would be participating in the study. Due to several constraints, the researchers chose available participants but kept them homogeneous by selecting those who were qualified to participate in the intermediate level of English. The SRFLLSQ was administered to 15 Iranian EFL learners in a pilot study to ensure that it was reliable in the Iranian context. Their validity was verified by Ph.D. graduates in the field of applied linguistics. Then, the available 64 EFL learners were randomly divided into two groups: Experimental and Control. Before exposure to the treatment, the SRFLLSQ was administered to both groups as the pretest. The purpose of the pre-test was to find the self-regulated strategy language learning preference of participants before treatment. After that, the participants in the experimental group received their particular treatment by using E-mind mapping technique in the classroom by the teacher. The teacher explained how the special software, Mind Meister, works to create mind maps and how they can use it. Mind Meister is a 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. The participants in the control group received a conventional way of teaching which had been the normal way of English teaching in the institute. The study lasted 15 sessions each 90 minutes for both groups. After the allotted period for treatment, exposure had passed, both groups were subjected to a posttest which was SRFLLSQ but the order of which was not similar to pretest to avoid test effects. The purpose of the post-test was to see if E- mind mapping technique had any effect on the participants' self-regulated learning strategy preferences.

### **3.5. Data Analysis Procedure**

To check the internal reliability of the instrument for the Iranian context, a pilot study was conducted to measure Cronbach's alpha. Statistical Package for the Social Sciences (SPSS) V.27 was used to analyze the collected data. Appropriacy, normality, and statistical assumptions were checked based on different approaches which will be described in the result section. Descriptive statistics such as frequency, mean, and percentage were estimated to answer the first research question. To answer the second

research question independent sample *t*-test as an inferential statistical test was run to compare the means of two independent groups including control and experimental groups.

#### 4. Results

After calculating the internal consistency of the instrument for the Iranian context (Table 2), the next step was to check the appropriacy, normality, and statistical assumption of the collected data. According to Warne (2020), to make sure about appropriacy and normality assumptions, the first point is to check the independence of the participants by selecting appropriate randomization method and design for the study which in this case uncontrolled-quota convenience sampling was utilized to select the main sample and again they were randomly divided into two groups namely control and experimental groups based on the between-subject true-experimental design. To check the normality assumption, qualities of skewness and kurtosis were calculated. Finally, Kolmogorov–Smirnov and Shapiro-Wilk tests were calculated as yard-stick relief values to make sure about the appropriate selection of statistical techniques whether parametric or non-parametric ones. Table 3, indicates the descriptive statistics and normality tests for SRLLS in the pre-test.

Table 3.

*Descriptive Statistics and Normality Tests for SRLLS in the Pre-test*

SRLLS	<i>F</i>	<i>M</i>	Percent	Skewness	Kurtosis	K-S <sup>a</sup>	S-W
Metacognitive	64	28.53	27.9%	-0.35	0.39	.200*	.614
Cognitive	64	34.17	33.5%	0.32	-0.36	.200*	.403
Meta-affective	64	12.85	12.6%	-.013	0.33	.200*	.818
Meta-sociocultural-interactive	64	16.81	16.5%	-0.32	0.26	.200*	.317
Sociocultural-interactive	64	9.79	9.5%	0.25	-0.03	.200*	.492

a. Lilliefors Significance Correction

\*This is a lower bound of the true significance.

As reported in Table 3, the most and the least rated SRLLS among the participants in the pre-test phase were cognitive (33.5%) and sociocultural-interactive (9.5%) accordingly. The dispersion for the scores of SRLLS appeared normal as the skewness and kurtosis ratios were between -1.96 to +1.96 (Jasrai, 2020). In another theory (Guerrero & Solis-Lemus, 2020), the skewness and kurtosis values between -2 to +2 also supports the assumption of

normality. Besides, the significance indices of the Kolmogorov–Smirnov (K-S) and Shapiro-Wilk (S-W) tests are above the critical value of 0.05 which is evidence of the presence of normality assumption in the collected data (Guerrero & Solis-Lemus, 2020). Moreover, as claimed by the findings, all of the research questions were dealt with the use of parametric statistics. To control the homogeneity of the participants divided into control and experimental groups in terms of their scores in SRLLS, descriptive statistics and independent samples t-test were calculated across each group in the pre-test phase (Table 4).

Table 4.

*Descriptive Statistics and Independent Samples T-test for the Pre-test*

	Control group		Experimental group		<i>t</i>	<i>df</i>	<i>Sig.</i>
	M	P	M	P			
Metacognitive	27.98	28.2%	29.07	27.7%	-1.99	62	0.08
Cognitive	34.51	34.8%	33.82	32.2%	1.35	62	0.18
Meta-affective	11.14	11.2%	14.55	13.8%	-4.16	62	0.06
Meta-sociocultural-interactive	15.87	16.0%	17.75	16.9%	-2.06	62	0.07
Sociocultural-interactive	9.69	9.8%	9.90	9.4%	-.272	62	0.21
N	32		32				

Based on the values presented in Table 4, no significant differences were found in SRLLS preferences among participants in the control and experimental groups in the pre-test phase, as all of the critical values were above 0.05. This point supports the homogeneity of the participants in these two groups based on their SRLLS scores. To check the effects of intervention and normality assumption of the SRLLS scores in the post-test phase, descriptive statistics, and normality tests were calculated (Table 5).

Table 5.

*Descriptive Statistics and Normality Tests for SRLLS in the Post-test*

SRLLS	F	M	Percent	Skewness	Kurtosis	K-S <sup>a</sup>	S-W
Metacognitive	64	38.3	29.7%	0.25	-0.28	.200*	.441
Cognitive	64	28.29	21.9%	0.22	-0.27	.200*	.369
Meta-affective	64	30.12	23.3%	-.025	0.36	.200*	.523
Meta-sociocultural-interactive	64	27.12	21.0%	-0.31	0.46	.200*	.401
Sociocultural-interactive	64	5.27	4.1%	0.26	-0.09	.200*	.633

a. Lilliefors Significance Correction

\*. This is a lower bound of the true significance.

As in Table 5, unlike the pre-test phase, metacognitive strategy (29.7%) was identified as the most preferred SRLSS among all of the participants in the post-test phase, and similar to the pre-test phase, sociocultural-interactive (4.1%) was determined as the least-preferred SRLLS. In addition, according to the skewness and kurtosis ratios, Kolmogorov–Smirnov (K-S), and Shapiro-Wilk (S-W) tests, the collected data in the post-test phase followed the assumption of normality. To check the effectiveness of the intervention and its significance, descriptive statistics and independent samples t-test were estimated across each group in the Post-test phase (Table 6).

Table 6.

*Descriptive Statistics and Independent Samples t-test for the Post-test*

	Control group		Experimental group		<i>t</i>	<i>df</i>	<i>Sig.</i>
	M	P	M	P			
Metacognitive	26.72	27.2%	32.6	29.6%	-1.13	62	0.00
Cognitive	33.92	34.5%	26.9	24.4%	2.18	62	0.00
Meta-affective	12.15	12.4%	21.8	19.8%	-1.66	62	0.03
Meta-sociocultural-interactive	16.10	16.4%	20.12	18.2%	-1.57	62	0.02
Sociocultural-interactive	9.44	9.5%	8.88	8.0%	.122	62	0.04
N	32		32				

As reported in Table 6, all of the critical values were below 0.05 that is an indication of significant differences in SRLSS preferences among participants in the control and experimental groups in the post-test phase. To have a better conceptualization of the findings, the SRLSS preferences of the experimental group in the pre and post-test phases were visualized in the following figure.

As displayed in Figure 1, the metacognitive strategy (MC) has been rated by 29.6% of the participants as the most preferred strategy in the post-test phase while in the pre-test phase, cognitive strategy (CO) was placed in this position (32.20%). Cognitive strategy (CO) was preferred by 24.40% of the participants as the second most-favored strategy in the post-test phase while in the pre-test phase metacognitive (MC) was reported to be placed in this rank followed by 27.70% hits from the participants. Sociocultural-interactive (SI) was rated as the least-preferred strategy among the participants in the pre- (9.40%) and post-test (8.00%) phases of this study.

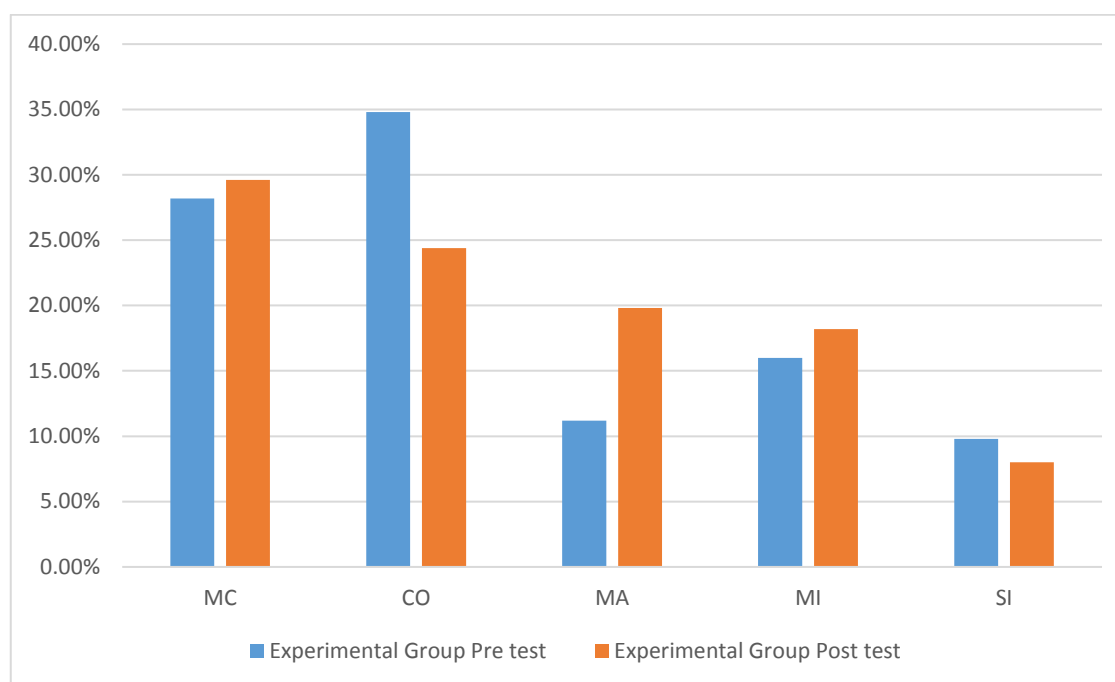


Figure 1. SRLLS preferences for the experimental group in the pre and post-test phases

## 5. Discussion

To answer the first research question about the kind of self-regulated learning strategies Iranian EFL learners utilize in the learning environment, the results indicated that the order of self-regulated strategy preferences among participants was: cognitive, metacognitive, meta-sociocultural-interactive, meta-affective, and sociocultural interactive. These results were in line with the results of the study conducted by Mahmoodi et al. (2014) in which cognitive and metacognitive SLR strategies were mostly favored by Iranian EFL learners. They were also in line with the studies which considered cognitive as the most and effective strategy used by Iranian EFL learners (e.g., Banisaeid & Huong, 2015)

Reviewing the post-test results illustrated that the E-mind mapping technique influenced the SRLLS of Iranian EFL learners as their preferences changed in the experimental group while there was not the case in the control group. Metacognitive, cognitive, meta-affective, meta-sociocultural-interactive, sociocultural-interactive were SRLLS preferences among those students who were in the experimental group and were thought through E-mind mapping techniques. The only fixed strategy in pre-and post-test was the sociocultural interactive strategy which E-mind mapping could not have any influence. As mind mapping is a brain-based technique and using E-mind mapping as

technology-based learning are both related to brain and mind organization and cognition approach, it could be reasonable that the percentages of metacognitive SRLLS were increased in the posttest. In other words, the E-mind mapping technique helped learners to enhance their metacognitive SRLLS. This is in line with prior research findings on the use of technology in encouraging participants' use of metacognitive strategies regularly (Gao & Shen, 2021).

In other words, participants employed cognitive and metacognitive strategies the most in the pretest, and their usage of metacognitive and cognitive strategies moved ahead of other strategies in the posttest. In the results of individuals whose learning was aided by the E-mind mapping approaches, cognitive strategies that rated first in a pretest fell to second place. The employment of the E-mind mapping technique enhanced meta-affective and meta-sociocultural-interactive strategies, which are rarely used by Iranian students in a teacher-led language classroom. Iranian EFL students in both conventional and E-mind mapping groups did not appear to use sociocultural-interactive strategies.

It was out of the expectation that adopting sociocultural interactive strategy decreased after using the E-mind mapping technique. It seems that focusing on cognitive strategy in conventional teacher-led and examination-oriented classrooms led to not much considering other SRLLS. In a less controlled environment, using mostly cognitive approaches to learning may reduce individuals' natural motivation and interest in learning. On the other hand, the results indicated that utilizing the E-mind mapping technique contributed to the balanced adoption of SRLLS in posttest compared to pre-test in which the big differences were identified.

Participants in the control group lacked satiation and emotion regulation abilities, which could reflect an engrained belief that English is considered as a formal course rather than a language for conversation and pleasure. It supports the claim that Iranian EFL students use the least emotive and social techniques when learning English. Learners may simply learn the language to improve their English exam results to get a competitive advantage, rather than maintaining communicative interest and motivation. In the learning environment, the E-mind mapping technique appears to have provided participants with a range of meta-affective, meta-sociocultural-interactive effects generated by the new technology.

## 6. Conclusion

The E-mind mapping technique benefited participants in adopting a set of learning strategies that differed in kind and frequency from those typical of an Iranian language classroom led by a teacher and focused on examinations. In this study participants' use of five types of SRLS were identified as Metacognitive, cognitive, meta-affective, meta-sociocultural-interactive, sociocultural-interactive based on Oxford's (2017) categorization. Participants employed cognitive and metacognitive strategies the most in the pretest, and their usage of metacognitive and cognitive strategies jumped ahead of other strategies in the posttest. In the results of individuals whose learning was aided by the E-mind mapping techniques, cognitive strategies that rated first in a pretest fell to second place. Meta-affective and meta-sociocultural-interactive strategies, rarely used by Iranian students in a teacher-fronted language classroom, also increased by using the E-mind mapping technique. Adopting sociocultural-interactive strategies, by Iranian EFL students both in conventional and E-mind mapping groups was not noticeable. These findings have implications for EFL learners' understanding and design of the E-mind mapping technique to establish acceptable techniques for self-directed learning. This poses challenges not just for classroom teachers in reducing their dominant role in the classroom, but also for curriculum designers and content curators in maintaining control over the authenticity of learning materials as well as the usability of technology and brain-based learning.

However, in Iran, the existing examination-oriented classroom curriculum and pedagogy may continue to be a barrier to Iranian EFL students developing awareness of the issue and the ability to take care of their learning. In an E-mind mapping-focused setting, learners utilized metacognitive strategy more frequently, demonstrating the value of technology-induced activities and learning processes in enabling autonomous learning and learner strategy building. Participants in this study have already had a learning experience that is not comparable to that of a regular teacher-led classroom, meaning that the way Iranian EFL learners learn and the strategies they employ may vary in the future. Modifications that may benefit learners in establishing autonomous learning and related learner strategies, on the other hand, will not occur unless the educational system experiences significant structural changes that place a larger emphasis on the learning process rather on evaluation. This may also necessitate a shift in teacher and learner perspectives on learning, as well as pedagogical innovations in material and task design

(i.e., technology-assisted and learner self-regulated) for the development of learning strategies at the conceptual and curriculum levels.

In terms of pedagogical implications, the findings highlight the need of incorporating language learning approaches into foreign language training and the value of SRL research in foreign language teaching. Some successful initiatives to strengthen students' self-regulated strategies through strategy training incorporated in education courses have also been made, illustrating the value of strategy training. The research shows teachers that effective strategy utilization comprises not just the ability to choose from a variety of techniques and procedures, but also a self-regulated component in which learners control their learning processes and so take responsibility for their development.

Only SRLS preferences of intermediate learners were investigated in the present study. Due to the prevalence of SRL studies in the foreign language setting, it is recommended that SRLS be examined at all levels of English proficiency. Conducting interviews with teachers and students to learn more about their perspectives on SRLS could help to strengthen the findings of this study.

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## Appendix

### Self-Regulated Foreign Language Learning Strategy Questionnaire (SRFLLSQ)

#### When I learn English, ...

##### Metacognitive

I think of the relationships between what I already know and new things I learn in English.

I first skim an English passage, then go back and read carefully.

I look for opportunities to read as much as possible in English.

I write notes, messages, letters, or reports in English.

I plan my schedule so I will have enough time to study English.

I pay attention when someone is speaking English.

I make summaries of information that I hear or read in English.

I try to find out how to be a better learner of English.

##### Cognitive

I connect the sound of a new English word and an image or picture of the word to help me remember the word.

I use the English words I know in different ways.

I find the meaning of any English word by dividing it into parts that I understand.

I use new English words in a sentence so I can remember them.

I try to find patterns (grammar) in English.

I try not to translate word for word.

##### Meta-affective

I notice if I am tense or nervous when I am studying or using English.

I encourage myself as I learn English so that I can learn what I would like.

I read in English as a leisure-time activity.

I organize my English language learning so that I always enjoy doing it.

I plan my English language learning so that I can perform better.

I have more success learning English when I feel like doing it.

I give myself a reward or treat when I do well in English.

I try to relax whenever I feel afraid of using English.

##### Meta-sociocultural-interactive

I try to learn about English-language cultures and/or other cultures through English.

I look for people I can talk to in English.

I look at English-language TV shows, movies, or websites to get to know the cultures of English native speakers and/or other cultures through English.

I choose leisure activities where I encounter English-language cultures and/or other cultures through English as well.

I plan what I want to find out about the cultures of English speakers and/or other cultures through English.

I practice English with my peers.

I look for similarities and differences between my own culture and the cultures of English native speakers and/or other cultures through English.

Getting to know English-language cultures helps me to learn the language.

**Sociocultural-interactive**

I start conversations in English.

I make up new words in English if I do not know the right ones.

When I speak with highly proficient speakers of English, I think it is important to get acquainted with their culture.

I encourage myself to speak English even when I feel afraid of making a mistake.