Original Article

Impact of Critical Thinking Instruction through Argument Mapping Techniques on Iranian Male and Female EFL Learners' Critical Thinking Ability and Reading Skill

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Abstract

This study addressed the impact of teaching critical thinking (CT) principles through argument mapping (AM) techniques on the CT and reading abilities of a number of Iranian male and female EFL learners who studied English at a language institute in Isfahan province. For this purpose, 30 male and 30 female intermediate EFL learners were chosen on the basis of their performance on the Oxford Quick Placement Test (OQPT); further, the reading section of an IELTS practice test was applied. For the collection of the required data, California Critical Thinking Skills Test (CCTST), which had been validated in Persian, was conducted twice, once before and once after the treatment. The study employed a quantitative pretest-treatment-posttest design in which AM techniques including information organization, structure reasoning, evidence consideration, assumption identification, evaluation of arguments, and communication of conclusions were introduced to the participants in 6 steps. Then, the CCTST and IELTS reading sections were administered again as the posttests. The statistical analysis of the obtained results using the paired-samples t test, based on the comparison of CT and reading ability according to the scores obtained from the pretest and posttest taken by the male and female learners, revealed the improvement in the five subcomponents belonging CT and reading ability from pretest to posttest. The present study provides insights useful for EFL teachers, learners and materials developers.

Keywords: Argument mapping, Critical thinking, Gender, Iranian EFL learners, Reading comprehension

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1. Introduction

In the today's' knowledge-driven world, those who think in a critical manner and continue to improve their knowledge could enjoy a great privilege (Stewart, 2014). Stewart also holds the view that CT can help people in the development of their analytical skills; so they can evaluate the data which is given to them and interpret them in the best possible manner. Many definitions have been focused on CT (e.g., Facione, 2011; Willingham, 2007); nevertheless, the definition serving the purposes of the current study is the one provided by Elder and Paul (2008); they hold the view that CT is a particular way of thinking in regard to any topic, meaning, or issue; the thinker can ameliorate the quality of his or her thinking by skillfully drawing on the structures which are inherent in thinking, making intellectual standards on them.

Critical thinking skills are necessary in almost every field of study or practice; this is because all individuals should be able to communicate their ideas, make good decisions, and analyze and solve problems in the correct way. CT has been long assumed as a skill which is used in the whole life of all people, helping them to make complicated and tough choices in their personal, academic and social lives. In this world, where things always change very quickly, CT cannot be regarded as only a luxury; as considered by many researchers, it can be regarded as a kind of skill that can be very vital for the person (Facione&Facione, 1996). Educational researchers have proved that CT should be pursued as a major goal of learning; it can be especially important in the academic education (Paul, 1987 & Ennis, 1996). There has already been a dramatic shift from considering learning as a type of rote learning to looking at it as a continually developing process of exploration and inquiry as well as reformulation of hypothetical statements (Pennycook, 1994). Further CT skills have attracted many researchers addressing learners' achievement and attitudes; in this regard, many language studies have shown the importance of improving thinking skills that are an advanced level , as well as the good effect of CT on the learners' success in the contexts which could be characterized as being more EFL (Hashemi&Ghanizadeh 2012).

CT has been shown to be play an effective role in developing wide variety of language skills generally, as well as reading comprehension ability more particularly (Bagheri, 2015). It can help people to be creative and to think more and in a much better way. In this way, readers can have an outline in their mind while reading to become critical. By developing such a practical and solid background in the major principles underlying critical thinking

and creativity, readers will be prepared to think in a more systematic, reasonable and imaginative way (Aloaili, 2005).

The relationship existing between critical thinking and reading skill has already been well substantiated in the literature. For instance, Norris and Phillips (1987) highlighted that reading is more than merely saying what you see on the page; rather, it is thinking. Beck (1989) holds that "there is no reading without reasoning" (p. 677). In addition, there are some researchers and theoreticians recognizing that reading involves thinking; among these, we can mention Ruggiero (1984). He has indicated that reading is mostly reasoning. Yu-hui, Li-rong and Yue (2010) have also stated that reading can be regarded as a thinking process which is meant to construct meaning.

One cognitive teaching technique that can be important in developing the reading ability is the use of some CT principles known as 'argument mapping'. Gelder (2013) holds the view that argument mapping is diagramming the structure of argument, which is broadly interpreted to cover all kinds of argumentative activity; these are such as reasoning, inferences, debates, and cases. We can decompose an argument into its claims; then can employ lines, boxes, colors and location in order to represent the relationships existing between various parts. The obtained map makes it possible for us to see how each element of an argument can be associated to every other one. Gelder (2007) has stated that argument maps should be in the form of a sentence that is declarative and each box must have a full sentence (not a phrase), expressing something and assuming a position (regardless of truth or falseness). One, however, should be explicit as to what precisely he means.

2. Literature Review

There are different definitions to clarify the concept of critical thinking. One definition that can be suitable for the purpose of the present study has been suggested by Bagheri (2015). This researcher has defined CT as the correct use of cognitive strategies that could have contribution to achieving the desired results. In addition, it was taken as an intention-oriented, functional and logical capacity. It's by far a mentality responsible for solving problems, drawing inferences, estimating probability, and making a correct decision. The individuals trained to think in a critical manner can practice such abilities in the proper ways, with having no uncertainty; this, often, wittingly, depends on the immediate context.

The right use of CT for the improvement of the EFL pedagogy can be assumed to be a modern issue of inquiry. The basic theoretical foundation of CT can be seen in the critical language awareness theory. This theory, by its very nature, is based on the role that the cognitive as well as metacognitive knowledge of learners can play in boosting their understanding of the language they want to learn in the right context (Fairclough, 1999). The results obtained from the research that has been conducted in a number of countries in Europe, such as UK, have revealed that applying CT principles in ESL classrooms could assist learners to be more practical and successful in their communication. Various kinds of oral and written discourse could also be generated. In addition, they could be highly creative in making use of a foreign language. It has also been demonstrated that CT potentials can ease language learning, which could be seen in the inferences that are drawn from the language parts that are not much familiar and reflections made on the relations existing between different languages (Lin & Mackay, 2004). So, CT potentials in EFL classes could improve the learners' awareness of their possible progress, ultimately resulting in the learners' autonomy.

'The Delphi Research Group', which was formed in 1990, consisted of forty six experts that are from the American Philosophical Association (APA). Regarding the concept of CT and the reflective thinker, they hold the view that critical thinking could be regarded as an intentional, self-organized evaluative activity resulting in interpretation, analysis, assessment and inference, in addition to explaining the evidential, conceptual, methodological, criteriological, or contextual considerations on which a given evaluation is based. Facione (1990) drew on the following definition of 'The Delphi Research Group' for CT. CT is necessary as a means of inquiry. So, CT could be considered as a facilitative device in teaching and an effective aid contributing to the individual and social life. While it is not identical with the good way of thinking, CT could be an unavoidable and self-rectifying human wonder.

Facione (1990) has also added the point that, according to the Delphi method, six aspects for CT could be envisaged; these include *interpretation*, which is the ability to perceive and explain the meaning or importance different types of experiences, conditions, information, events, assessments, agreements, principles, rules, strategies or criteria. As the second aspect, *analysis* refers to the capability of finding the intended and definite inferential connections among statements, questions, concepts, descriptions or other forms

of representation that are meant to state ideas, assessment, experiences, reasons, information, or opinions. *Evaluation* is the skill that helps to assess the extent to which statements or other representations reflecting descriptions of a person's perception, experience, situation, judgment, belief, or opinion are plausible; this is meant to evaluate the logical strength of the actual or intended inferential relationships existing among statements, descriptions, questions or other forms of representation. *Inference* could be regarded as quality of identifying and securing elements which are required in order to draw definite conclusions; it also contributes to the formation of conjectures and hypotheses, consideration of relevant information and exploration of the consequences that flow from data, statements, principles, evidence, judgments, beliefs, ideas, concepts, descriptions, questions, or other forms of representation. *Explanation* refers to the ability to express the results of one's reasoning; it helps to explain that reasoning according to the evidential, conceptual, methodological, criteriological and contextual considerations on which the results are based; it is also concerned with expressing one's reasoning in the form of tenable and plausible arguments. Finally, *self-regulation* could be defined as the ability to check one's cognitive activities in a self-conscious manner; there are some elements which are used in those activities, as well as the results induced, particularly by applying skills in the analysis and evaluation to one's own inferential judgments; so, there is a view toward questioning, confirming, validating, or correcting the way of reasoning or one's results.

Van Gelder (2005) also considered an argument map as a graphic scheme which is applied in order to represent the structure of logic and argumentation. Further he has contended that dynamic involvement in CT drills by applying argument mapping could give learners the opportunity become more effective reflective thinkers. Planning thinking through using argument maps in language permits learners in order to screen their thinking, distinguish critical issues and presumptions, as well as more effectively clarifying their experiences. The following procedures have been enumerated for making an argument mapping by Van Gelder (2007):

(a) Distinguishing a claim though one single reason (composed of two co-premises) leads to forming a claim having two independent reasons, and (b) every argument is composed of one or more simple ones. A simple argument can be regarded as the building block of all arguments; it is made of one claim and one reason (with two or more co-premises). A complex argument, as the one presented above, has a number of simple

arguments which are linked together. In the example brought above, four simple arguments do exist, as well as one objection and one rebuttal. Overall, they can form a debate. Also, (c) the exact structure of an argument can be quite important. For instance, if side A has drawn on two appropriate reasons to make a conclusion about something, and the opposite side (side B) thinks that one of such reasons is bad, then the A's conclusion may continue to be true/warranted if the remaining, unobjected reason is convincing; (d) an argument map can represent an argument by displaying exactly where two sides mat disagree on a given issue. In the example mentioned above, side B is in disagreement with the side A's conclusion, although it accepts the reasons (1 and 2) given by A. It is in disagreement with the A's conclusion as a separate objection to the conclusion. Side A chooses to rebut the objection of side B, thereby (it hopes) making the objection invalid and keeping its conclusion. Finally, (e) it should be noted that an argument map represents the structure of the argument/debate; every box may not be necessarily true; however, the initial step is understanding the argument structure.

A study conducted by Dwyer, Hogan, and Stewart (2015) compared the deep-rooted effect of argument mapping on the CT learning potential of the learners who were ranked high and low on the basic CT tendencies. The results revealed the positive effect of argument mapping, with a higher CT potential being associated with higher logical judgment scores at all assessment times.

One other research work was conducted by Gelder, Bissett and Cumming (2004). A kind of argument mapping software package was accordingly developed in order to promote the CT ability of the learners. According to the obtained data, it was revealed that the CT potential of the learners was promoted up to 20%. Given that CT is a cognitive skill which is non-specific and it can be very difficult to improve performance in these types of skills, as a significant and valuable kind of advancement, the novel approach could be quite effective. The results of the study were, therefore, consistent with those obtained in the research carried out by Dwyer, Hogan, and Stewart (2012). They investigated the impact of a kind of critical thinking (CT) technique in the form of an e-learning course which was taught through argument mapping on the CT ability measures. Seventy-four undergraduate psychology students were assigned to either an AM-infused CT e-learning course or a non-instruction control group; they were tested twice, once before and once after an 8-week intervention period in terms of the CT ability by employing the Halpern Critical Thinking

Assessment. The results revealed that participation in the AM-infused CT course remarkably improved the overall CT ability.

There are many other relevant studies, such as Elsegood (2007), and Eftekhari, Sotoudehnama, Marandi (2016), which have been focused on the impact that argument mapping can have on the learners' critical thinking. So, argument mapping, due to its beneficial techniques, can be argued to positively influence the EFL learner's critical thinking ability.

The review of the literature regarding the effect of AM on the CT ability of learners, therefore, suggests that, to the best of the researcher's knowledge, no study has yet been conducted on the effect of applying AM on the CT ability and reading skill of EFL learners in the Iranian context. In addition, gender could be considered as an influential factor that has been neglected in the literature. Consequently, we tried to find appropriate answers to the following questions:

1. Does instruction by critical thinking through the use "Argument Mapping" have a statistically significant impact on the critical thinking potential of the EFL learners'?

2. Does instruction by critical thinking through the use of "Argument Mapping" have a significant effect on the reading ability of Iranian EFL learners'?

3. Methodology

In this section, we elaborate on the design of the study, characteristics of the participants, data collection instruments and the used procedures.

3.1. Research Design and Setting

The present research was a quantitative pretest-treatment-posttest quasi-experimental one. So, the independent variable was CT instruction by means of AM and the dependent variables included CT and reading abilities. This research was carried out in two branches of the ILI institute in Isfahan, Iran. The reason why this institute was selected was related its reputation and high rank among other institutes located in the city, as well as the large number of enthusiastic learners who attended the institute at the time of this study. This study was carried out in the summer semester, 2019, with a larger number of learners attending the institute classes.

3.2. Participants

The participants in the present study consisted of 30 male and 30 female EFL learners who studied English at two branches of the ILI institute in Isfahan, Iran. The first language of all learners was Persian and they were in the age range of 17 to 25. They were selected out of a larger population pool of 100 EFL learners studying at the institute according to their performance on the Oxford Quick Placement Test and the related rating rubric. To ensure about their reading ability at the beginning of the study, the reading section belonging to an IELTS practice test was also conducted. According to the tests rating rubric, the intermediate EFL learners were selected to participate in this study. Table 1 demonstrates the demographic data related to the participants:

Table1.

Demographic Background of the Participants

No. of Students	60
Gender	30 females &30 males
Native Language	Persian
Field of Study	EFL
Institute	ILI
Academic Year	2019

3.3. Instruments

The following instruments were used in the study:

3.3.1. Oxford Quick Placement Test (OQPT)

OQPT, which is a valid and reliable test, was used as a general proficiency test at the beginning of the study. This test, developed by University of Cambridge Local Examinations Syndicate, consists of 60 items The test is divided into two parts: part one, which contains 40 items: testing situations (five questions), cloze passages– testing prepositions, grammar, pronouns, and vocabulary– (15 questions), and completion items (20 questions). The second part includes 20 items; 10 questions on cloze passages and 10 completion type items. All items are in the multiple-choice format. The reliability index for this test was estimated to be 0.89; so, it could be claimed that it served as a reliable instrument in the present research.

To save face and the construct validity of the OQPT test, four EFL experts were asked to remove any possible ambiguity from the test items.

3.3.2. California Critical Thinking Skills Test (CCTST)

It serves as an objective measure of the core reasoning skills which are needed for reflective decision making, in relation to what to believe or what to do. CCTST has been designed in order to engage the test-takers' reasoning skills. The test items vary in terms of difficulty and complexity. CCTST-2000 takes 45 minutes to be completed under timed conditions; it can also be administered in an untimed manner as well. In this research, the version of the California Critical Thinking test which had been translated into Persian was administered in the untimed form. The Form A, which represented the pre-test, and the form B, which served as the post-test, were taken by the students, respectively. The total score for the California Critical Thinking Test was 34.

These 34 items measure five categories of critical thinking ability; these include analysis (including 9 items), evaluation (consisting of 14 items), inference (representing11 items), deductive reasoning (making16 items), and inductive reasoning (incorporating14 items). CCTST is, in fact, a multiple-choice test that has been designed to be scored dichotomously, with one correct answer and three or four distractors. This test reliability has been reported to be .78 to .80 using Cronbach alpha (Facione, 1990). Khodamorady et al (2006) had translated this test into Persian, reporting a satisfactory construct validity scale. They have reported the reliability of .62 for the whole test, .71 for analysis, .77 for evaluation, .77 for inference, .71 for deductive reasoning, and .71 for inductive reasoning, respectively. To ensure the reliability of the translation, the use was also made of the back-translation technique.

3.3.3. Reading Section of the IELTS Practice Test Used as the Pretest and Posttest

For the determination of the reading ability of the participants at the very beginning of the study, the reading section of the IELTS practice test (#5) was given twice: before and after treatment. The test reliability was estimated based on some pilot study involving 15 EFL learners from the same institute branches that had similar characteristics as the main participants. KR-21 formula was applied; the results turned out to be 0.78. To preserve the

face and construct validity of the above-mentioned pretest/posttest, the test items were controlled by four experts in order to disambiguate any possible item.

3.4. Data Collection Procedure

Since this study research was mainly intended to find the effect that critical thinking (CT) instruction principles via argument mapping (AM) techniques can have on the CT and reading abilities of Iranian male and female EFL learners, homogeneous samples of male and female EFL learners were needed. Therefore, through the administration of OQPT and also, the reading section belonging to one of the IELTS practice tests, 60 EFL learners (30 males & 30 females) who were at the intermediate level of language proficiency were chosen to participate in the present research. Afterward, that version of the California Critical Thinking Skills Test (CCTST) which had been Persian validated was conducted to find the degree of CT in the participants before treatment. After that, for the treatment phase of the study, AM techniques were applied, as described below:

As the first step, the participants were asked to find the information existing in the passage. The key was to select the information and structure it in an appropriate manner. According to the grouping maps' Rationale, students were able to highlight information obtained from the passage and could draw maps that were colorful, as well as the existing images. Such structured and colorful maps could serve as a guide for the students in order to structure the available information in a manner that the connections existing between the main topic and its different themes or categories could be revealed.

As the second step, the participants were asked to give opinions as well as their reasons in the support of them for having their particular views. The use of the Rationale's reasoning maps could help them to substantiate their responses and to take a wide range of opinions into their account. AM uses color conventions in order to represent reasoning, with green, red, and orange representing reasons, objections and rebuttals, respectively. It also had connecting words, helping to easily understand the relationship existing between statements.

As the third step, the most important point for AM was the evidence underpinning the present claims. Basis boxes, as a feature of the Rationale, could serve as a means in order to show the basis on which some particular statement has been given. Such icons could act some kind of visual guide showing the range of studies applied and the power of the presented evidence that has been provided.

As the step four, the available arguments were required for analysis. This could be a number of things like considering the argument logical structure in order to make sure about validity or well-formedness, and findings assumptions or a number of co-premises. In regard to the cases who needed high levels analysis, Rationale provided the map format of analysis in order to represent the relationships existing between the main premises as well as the co-premises.

As the step five, when the arguments which were for and/or against a particular issue have been structured in a logical manner, they had to go under evaluation. The mentioned Rationale could serve as some kind if visual guide to evaluate claims and the obtained evidence; so as the color gets stronger, the argument becomes stronger too, where as icons are designated are being acceptable or claims that are rejected. During this process which involves arguments evaluation, the color as well as icons could provide some type of straightforward understanding that could lead to the representation of the possible conclusion.

As the sixth step, it is necessary to present ideas in an oral manner or in the form of writing; this was usually the distinctive feature distinguishing the good results from the average ones. The Rationale included essay and some kind of templates for letter writing which were meant to develop the skills as well as the confidence of students. Templates could provide instruction and assist the prose generation. After being exported, the result was some essay plan that is structured, having detailed instructions in order to ensure and facilitate the comprehension of the prose that is clear as well as systematic.

When the above-mentioned principles were applied, the reading sections belonging to CCTST and IELTS were administered again as the posttests. Eventually, the results were inserted into SPSS for the purpose of analysis.

3.5. Data Analysis Procedure

The analysis procedure was applied in order to describe and justify the methodologies employed to conduct the present study. More specifically, this study investigated whether argument mapping methods had any significant effects on the participants' reading ability and critical thinking skills. So, the data obtained from the pre-test and post-tests scores of the learners were fed into SPSS and such statistical tests as paired-samples t-test in order to explore the possible answer to the research questions posed in the study research.

4. Results

The data obtained from the pretest and posttest scores of the learners' CT and reading ability were fed into SPSS and such statistical tests as paired-samples *t*-test were utilized. The statistical analysis of the available data and the obtained results can be seen below.

4.1. Argument Mapping and Critical Thinking

Table 2 represents the results related to the comparison of the pretest and posttest scores of the male learners in the argument mapping group (AMG):

Table 2

Results of the Paired-Samples t Test Comparing the CT Pretest and Posttest Scores of the Male Learners in the AM Group

Tests	Mean	*N*	*SD*	*t*	*Df*	*Sig.*
Pretest Analysis	3.03	30	1.44	-7.37	29	.00
Posttest Analysis	4.03	30	1.18			
Pretest Deductive	5.13	30	1.40	-5.88	29	.00
Posttest Deductive	6.53	30	1.40			
Pretest Inference	3.50	30	1.10	-5.17	29	.00
Posttest Inference	4.30	30	.95			
Pretest Inductive	4.30	30	2.05	-5.34	29	.00
Posttest Inductive	5.20	30	1.86			
Pretest Evaluation	4.00	30	1.43	-5.28	29	.00
Posttest Evaluation	4.60	30	1.16			

As shown, the male learners in the AM group showed improvement in terms of the five subcomponents of CT, from pretest to posttest. As a case in point, in the subscale of analysis, they received a mean score of 3.03 on the pretest, while they gained the mean score of 4.03 on the posttest. The difference existing between the pretest and posttest scores of the male learners on this subscale was, therefore, statistically significant as the *p* value under the *Sig.* column was smaller than the significance alpha level ($p < .05$). This was also the case for the other subcomponents of CT; in other words, it was found that the male learners in the AM group improved significantly from the pretest to posttest in some areas including analysis, deductive reasoning, inference, inductive reasoning and evaluation. Table 3 represents a similar analysis for the female learners in the AM group:

Table 3

Results of the Paired-Samples t Test Comparing the CT Pretest and Posttest Scores of the Female Learners in the AM Group

Tests	Mean	N	SD	t	Df	Sig.
Pretest Analysis	3.13	30	.97	-6.17	29	.00
Posttest Analysis	4.06	30	.69			
Pretest Deductive	5.26	30	1.20	-4.28	29	.00
Posttest Deductive	6.53	30	1.22			
Pretest Inference	3.56	30	.89	-3.24	29	.00
Posttest Inference	4.23	30	.72			
Pretest Inductive	4.46	30	1.30	-3.06	29	.00
Posttest Inductive	5.33	30	1.37			
Pretest Evaluation	4.16	30	1.05	-1.36	29	.18
Posttest Evaluation	4.56	30	1.30			

The results which were obtained for the male learners in the AM group were almost true for their female counterparts as well (except for the subscale of evaluation); this means that female learners in the AM group exhibited significant improvements from the pretest to posttest in terms of the subscales of analysis, deductive reasoning, inference, and inductive reasoning. Despite this, their improvement from the mean score of 4.16 on the pretest to the mean score of 4.56 on the posttest did not show any statistical significance.

4.2. Results for Reading Comprehension

The effects of argument mapping on the reading comprehension of the EFL learners are examined below.

Table 4 represents the results related to the comparison of the AMG male learners' pretest and posttest of reading comprehension. A similar analysis conducted for females in the AMG group is presented:

Table 4

Results of the Paired-Samples t Test Comparing the Reading Comprehension Pretest and Posttest Scores of the Male Learners in the AMG

Tests	Mean	N	SD	T	df	Sig.
Pretest	18.16	30	4.11	-11.18	29	.00

Posttest	26.10	30	1.76

The *p* value, as shown in Table 4, was found to be smaller than the significance level ($p < .05$), thereby revealing that male learners in the AMG significantly progressed from pretest to the posttest of reading comprehension owing to exposure to the argument mapping intervention. The results of the female learners in the AMG can be seen in Table 5:

Table 5

Results of the Paired-Samples t Test Comparing the Reading Comprehension Pretest and Posttest Scores of the Female Learners in the AMG

Tests	Mean	*N*	*SD*	*t*	*df*	*Sig.*
Pretest	18.36	30	4.08	-11.52	29	.00
Posttest	25.93	30	2.14			

Since the *p* value, as shown in Table 5, was smaller than the significance level ($p < .05$), the female learners in the AMG could experience significant gains from pretest to the posttest of reading comprehension since they could have exposure to argument mapping.

5. Discussion

The results, therefore, demonstrated that male and female EFL learners' critical thinking ability in the argument mapping group showed significant improvement from pretest to posttest in such various areas of critical thinking as analysis, deductive reasoning, inference, inductive reasoning and evaluation.

As pinpointed by Gelder (2005), an argument map could be regarded as a graphical method used to illustrate the structure of reasoning and argumentation. He also argued that deliberately engaging students in critical thinking exercises by applying argument mapping could help them to become better critical thinkers. Planning reasoning through argument maps in language skills would assist students to monitor their reasoning, explore important issues and assumptions, and more easily clarify their insights.

Building on the words of Gelder (2013), argument mapping could be regarded a way to show the arguments logical structure in a visual manner; therefore, the learners can decompose an argument into its constituent claims; use can be made of lines, boxes, colors and location in order to indicate the relationships existing between various parts. The

obtained map makes it possible for the users to view precisely how each component of an argument can be connected to every other one. Gelder (2007) has also pointed out that this technique is necessary for advanced critical thinking. One influential advantage of this method is that users could be encouraged to give support to their responses and to take different opinions into their account; however, one major problem is that while a large number of individuals may provide opinions, they hardly give reasons to endorse their particular view. So, maps used in Rationale reasoning can help individuals to make use of the existing color conventions in order to display reasoning; green represents reasons, red stands for objections and finally, orange denotes rebuttals. Further, it employs connecting words to ensure a good understanding of the relationship existing between statements.

The findings gain support from a number of the previous investigations. For example, the study implemented by Dwyer, Hogan and Stewart (2015) can be mentioned here. That study made a comparison of the immediate post-intervention and the long-term effects of argument mapping on the critical thinking training ability of students who scores high and low on baseline critical thinking dispositions. It was revealed that the main effect of argument mapping with higher critical thinking disposition was associated with the higher rationale judgment scores at all testing times.

One other similar study was carried out by Gelder, Bissett and Cumming (2004). A special argument mapping software package was accordingly developed in order to improve the students' critical thinking ability. The obtained data revealed that students could improve their CT skills by 20%. As CT can be regarded as a kind of cognitive skill that is also generic, and it is not commonly easy to improve the individual's performance in such types of skills, this could be taken as a considerable and worthwhile improvement, thereby showing that the new approach works quite well. The results obtained in the research were also found to be in agreement with those of the research study conducted by Dwyer, Hogan, and Stewart (2012). These researchers addressed the possible impacts of some critical thinking (CT) course in the field of e-learning that had been presented through the technique of argument mapping on the CT ability measures. Accordingly, seventy-four undergraduate students majoring in psychology were assigned to two groups: an AM-infused CT e-learning course or a control group with no instruction; they were tested twice: once both before and after an 8-week intervention period in regard to the participants'   CT ability by conducting the

Halpern Critical Thinking Assessment. The results indicated that participation in the CT course remarkably boosted the overall ability in terms of CT.

There are many other relevant studies such as Elsegood (2007) and Eftekhari, Sotoudehnama, Marandi (2016), which addressed impact of argument mapping on the individuals' critical thinking; the results were in line with those obtained in the current research. Therefore, it could be argued that argument mapping, owing to its beneficial techniques, could have a positive impact on the EFL learners' critical thinking ability.

The relationship existing between critical thinking and reading skill has been well substantiated in the literature. For instance, Norris and Phillips (1987) highlighted that reading is more than only uttering what you see on the page; it is, in fact, thinking. According to Beck (1989), "there is no reading without reasoning" (p. 677). In addition, there are some researchers and scholars recognizing that reading involves thinking; we can, for example, refer to Ruggiero (1984). He has indicated that reading is reasoning. Yu-hui, Li-rong, and Yue (2010) have also stated that reading involves a thinking process intended to construct meaning.

Comprehension itself has been viewed as a critical thinking process. For example, according to a schema theory description of reading, we can look at a critical thinking act (Aloaili, 2005; Anderson & Pearson, 1984; Collins, Brown, & Larkin, 1980; Norris & Phillips, 1987; Rumelhart, 1980). Lewis (1991) has, for instance, argued that considering reading as a critical thinking act gains more credit when some of the components of the reading process are considered as automatic and necessary (such automatic processes as word identification, derivation of meaning for most words, and assignment of importance), but not sufficient to construct text understanding.

Despite this, it is not much argued that a learner should be proficient at every skill in order to be regarded as having critical thinking (CT) ability. There is the unanimity that (e.g.,Yu-hui, Li-rong& Yue, 2010) the inclusion of analysis, evaluation and inference is central to critical thinking. So, interpretation, explanation and self-regulation are also central to CT. The experts do not consider CT some kind of knowledge that should be transferred to students as a school subject along with others. Like reading and writing, CT has applications in all areas of life and learning. Further, similar to reading and writing, CT instruction can be realized in curricula which are rich with discipline-specific information or

in those   relying on the events occurring in everyday life as the basis for developing one's CT.

The results were also in line with many prior studies reported in the literature on argument mapping. As a example, Malmir and Khosravi (2018) addressed the effect of some instruction based on argument mapping on the Iranian EFL learners writing development. The results showed that the strategies used in argument mapping could have a significant impact on improving the individuals writing ability and participants' writing as far as grammar, coherence, cohesion, and task achievement were concerned.

Dwyer, Hogan, and Stewart (2012) also addressed the effects of argument mapping on the students' memory and comprehension performance. Accordingly, three experiments compared argument map reading and construction with hierarchical outlining, text summarization, and text reading as the learning methods by probing the subsequent memory and comprehension performance. The obtained results indicated that argument map reading and construction remarkably improved the subsequent immediate recall for arguments, in both passive and active learning settings. These findings also highlight the point that AM could serve as a useful learning and teaching methodology, particularly when it is compared with standard text-based learning.

6. Conclusion

To address the research questions posed in the present study, some paired-samples *t* tests were conducted on the participants critical thinking as well as reading comprehension a number of Iranian male as well as female EFL learners in some pretests and posttests. Based on the statistical analysis performed,   we could show the positive effects of the technique of argument mapping on the ability of critical thinking as well as the reading comprehension of those who were addressed in this research. This positive effect could be related to the advantages associated with the particular instruction of this technique, namely, the argument mapping technique.

Among the positive aspects of this technique, one can mention the schematic representation of the argument structure, which includes any possible type of argumentative activity, like reasoning, inferences, debates and cases. Based on this technique, the logical structure of arguments can be represented in a visual manner. The argument can be decomposed its constituent claims, using lines, boxes, colors and location in order to

represent the interconnections existing between different parts. The resulting map could show how different parts of an argument are related to each other one. Six steps are involved in representing the information via the argument maps, facilitating the learner's critical thinking ability. These include organizing information, structuring the reasoning, considering the available evidence, identifying the existing assumptions, evaluating the presented arguments, and communicating the plausible conclusions.

As stated by Gelder (2007) by employing argument maps, students should have no problem in information location. The key point is to select the information and structure in an appropriate manner. By using the grouping maps in the rationale, students are able to highlight the existing information, as obtained from the concerned passage, and make colorful maps as well as images. Such maps can encourage individuals to provide evidence in the support of their responses,   in addition to considering different opinions. It utilizes color conventions in order to exhibit reasoning; green represents   reasons, red indicates objections and orange reflects rebuttals. Basis boxes of the rationale can serve as a tool to probe the basis on which a statement has been given. The icons could act some kind of visual guide to show the research works and the strength of the proof that has been provided. For those individuals who needs analysis higher levels, such a kind of rationale can provide the analysis map format in order to represent the relationships existing between the main premises as well as the existing co-premises. Rationale also serves as a kind of visual guide to evaluate claims and the available evidence; so, when the color gets stronger, the argument becomes stronger, while icons are designated as being acceptable and/ or rejected claims. Therefore, it is necessary to present ideas in an oral manner or in the form of writing; very often, it serves as a distinctive feature distinguishing good results from the average ones. This could be realized in the final step, which is   the communication of the obtained information.

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