Blended Learning, Computer-based, and Conventional Reading Instruction Affecting EFL Learners' Self-regulation and Critical Thinking

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Abstract

The aim of the present study was to investigate the effects of the effect of instructional techniques (blended learning, jigsaw, and scaffolding) on Iranian EFL learners' self-regulation and critical thinking. To this end, 171 male and female intermediate-level Iranian EFL learners were selected based on cluster sampling. Initially, the Michigan Test of English Language Proficiency (MTELP) was administered to the participants to make sure that there were no significant differences among the participants in terms of their language proficiency level. The participants were in five groups; each group was randomly assigned to a different treatment condition. Two questionnaires were used twice in this study, at the beginning of the course as a pretest and at the end of the course as a posttest. The ANCOVA (Analysis of Covariance) procedure was used to analyze the obtained data. The results indicated that these techniques have more or less the same effect on learners' self-regulation both in conventional and computer-based contexts. It was also found that the conventional scaffolding technique is significantly more effective on critical thinking than the conventional jigsaw and the blended learning groups. However, in the computer-based context, blended learning turned out to be more effective on critical thinking than computer-based jigsaw, which was, in turn, significantly more effective than computer-based scaffolding. These findings may have pedagogical and theoretical implications for language learners, teachers, educational systems and policy makers.

Keywords: Self-regulation, Critical thinking, Collaborative Learning, Blended learning, Jigsaw, scaffolding.

1. Introduction

Reading is a crucial and multi-faceted skill that serves a wide range of purposes for readers (Grabe, 1991). It can be considered a significant skill without which a true comprehension cannot take place (Alfaki, 2014). For a number of decades, a large body of research has been devoted to understanding the variety of elements and techniques to optimize learning and teaching outcomes, especially regarding this important skill. Without doubt, there is more than one way to true comprehension, and this entails a lot of training for readers.

The findings of the research on the concept of reading comprehension can help educationalists to design instructional materials which include instructional reading techniques like scaffolding, blended learning, and jigsaw in order to improve reading-related traits. Consequently, it is of paramount importance to develop a curriculum which includes the above-noted techniques to teach readers how to read. Also, it is worth mentioning that in the modern world, the shift is from teacher-centered toward learner-centered education, and this highlights the role of learners more than the teacher's role. As it is clear, a learner is a multi-dimensional creature and different aspects like personal, cognitive and emotional factors are integrated with the learner and can affect the way he/she learns a skill like reading. The present study is an attempt to investigate the effect of different instructional techniques in computer-based and conventional contexts on self-regulation and critical thinking. It focuses on the following research questions:

1. Are there any significant differences among the effects of jigsaw and scaffolding in a conventional context and blended learning on EFL learners' self-regulation?
2. Are there any significant differences among the effects of jigsaw and scaffolding in a computer-based context and blended learning on EFL learners' self-regulation?
3. Are there any significant differences among the effects of jigsaw and scaffolding in a conventional context and blended learning on EFL learners' critical thinking?
4. Are there any significant differences among the effects of jigsaw and scaffolding in a computer-based context and blended learning on EFL learners' critical thinking?

2. Literature Review
2.1. Collaborative Learning

In autonomous learning environments, students do not rely solely on their teachers. They are not encouraged just by their teachers' approval or praise and they do not wait for correction, advice or instruction only on the part of their instructors. Instead, the focus is shifted to pairs, groups and whole class, and teacher acts as a facilitator to developing language skills (Jones, 2007).

Moreillon (2007) recommends that if educators are supposed to strengthen their academic programs, sharing responsibility with all students can be of substantial help. To become lifelong readers, students need to be given effective tools or cooperative learning techniques to turn into strategic readers. Educators must ensure that learners have a variety of opportunities to develop and improve skills which are the key to reading effectively. But how can teachers develop such independence in language learning? And how can learners be independent decision makers? There are a number of instructional techniques which can be used in educational settings, among which scaffolding, blended learning and jigsaw are of concern here.

Wood, Bruner and Ross (1976) describe scaffolding as a process of providing learners with a tool to solve a problem, and perform a task or reach a goal, which is otherwise

impossible to achieve. It has also been defined as temporary and adaptive support which is provided for learners so as not to have any difficulty in mastering a task or concept which is otherwise hard to grasp individually. This assistance is gradually reduced as learners become capable of completing the tasks or understanding the concepts independently (Smit, Eerde & Bakker, 2013).

Karimi and Jalilvand (2014), who investigated the effectiveness of peer and teacher scaffolding on reading comprehension, maintain that peer-teacher scaffolding has significantly more positive effects on EFL learners' reading comprehension ability compared to just peer scaffolding alone.

Pre-teaching vocabulary as a scaffolding strategy is a technique that is known as front- loading. Along with having the students to look up the definitions of some of the hard words in the texts before the reading task, the teachers who serve as guides introduce the words in contexts. They also give learners time to discuss the new words in small or whole groups so that they tackle the challenging texts and retain their interest. Tapping into learners' prior knowledge as another scaffolding strategy is done through asking students to share their ideas and experiences on the content of the passage (Alber, 2011).

In spite of various definitions put forward for blended learning, so far no consensus has been reached among scholars on one definition. Procter (2003) points out that blended learning is an effective integration of various modes of delivery, teaching models and learning styles. Kim (2007) defines it as "combining the traditional instructor-led classroom learning and technology-based e-learning "(p.1). He also proposed a methodology to make blended learning more efficient. He is of the opinion that because traditional classroom learning along with e-learning are tied with some merits and demerits, it is advisable to combine the advantages of both of them and make a new model which is called blended learning.

 Rosen and Stewart (2013) believe that one new way of using online learning in classrooms is 'Flipped Learning', in which the whole course is uploaded on to the internet or social media. Students are required to review the online materials, for example a reading comprehension text, before attending their regular class. They are asked to analyze the new words and ambiguous structures and focus on the main ideas of the texts. Later and during face-to-face classes, the trainers focus more on weak learners who need more help, and those who have mastered the objectives can be the leaders of their own groups to provide stronger feedback to the other peers.

The jigsaw learning method is another cooperative technique which was used in this study**.** Shehadeh (1999) believes that through the application of the jigsaw method, learners are encouraged to use target language more actively and more efficiently. Littlewood (2009) recognizes it as one of the most prevalent methods which can be employed in an attempt to develop collaborative learning.

Jigsaw is a method which can lead to learners' active participation during learning process (Sahin, 2010) so that they can focus their attention more and become highly capable of expressing their ideas more easily. It fosters learners' confidence and ends in their appreciation of other peoples' opinions (Marhamah & Mulyadi, 2013).

The results of a number of investigations support the positive impact of jigsaw during teaching /learning process. Sharan (1980) carried out an investigation on the effect of Jigsaw Classroom method, which is categorized as a peer-tutoring method, on learners' attitudes and achievements. Students' peer cooperation and tutoring in the classroom was fostered through

the application of this method, which created interdependence among learners as a result of dividing the learning task among them. The results of the study showed a significant difference in learners' attitudes, and students displayed higher perceptions of self. Also, Sami Ali (2001) explored the effect of the jigsaw technique on learners' reading comprehension and anxiety. The findings of the study supported the use of the jigsaw technique as an effective method to lower students' anxiety and improve their reading comprehension.

In addition, Oludipe and Awokoy (2010) investigated the impact of jigsaw on learners' anxiety for learning chemistry; the findings indicated that through the application of the jigsaw method, learners' chemistry anxiety reduced considerably. Kazemi (2012) made an attempt to examine the efficiency of the jigsaw technique on the reading comprehension achievement. The results indicated that students' post-test performance improved in comparison with that of their pre-test. The findings further showed that jigsaw activities fostered the development of communicative competence. Marhamah and Mulyadi (2013) assessed the impact of jigsaw on second-year undergraduates' achievement of teaching/learning in Indonesia, and concluded that it had a significant main effect on these students, especially in large classes. It also promoted positive attitude and interest in learners. In another study, Nozohouri, Mahmoodi, Adhami, and Rasouli (2016) investigated the effects of jigsaw and traditional learning on the reading comprehension achievement; the findings indicated that jigsaw is an effective teaching learning method for overcrowded English classes. It was also found that the Jigsaw group students' reading comprehension was better than that of those in traditional learning context.

In all such studies, through the application of the jigsaw technique, students are encouraged to better participate in their learning, motivated to learn larger amounts of materials faster than traditional ways and inspired to share information with their classmates.

2.2. Self-Regulation (SR)

There is an abundance of definitions of SR, and the term has been interpreted differently by different people. The term 'self-regulation' is made up of two words: 'self ', which means the actor or a group of people who work together, and the word 'regulation', which refers to what the actor does (Campbell, 1999). Zimmerman (1989) refers to self-generated as "thoughts, feelings, and actions that are planned and cyclically adapted to attain personal goals. This definition assumes the importance of three elements: students' self-regulated learning strategies, self-efficacy perceptions of performance skill, and commitment to academic goals" (p.329). According to Kanfer and Kanfer (1991), SR refers to "the interpersonal processes by which an individual exercises control over the direction, persistence, and intensity of thinking, affect, and behavior for the purpose of goal attainment" (p.291). Kuo, Walker, Belland, Schroder and Kuo (2014) theorize that motivation and learning strategies which are used by students to reach their learning goals constitute the premise which underlies self-regulation. The bilateral role of goal setting, self-evaluation and self-efficacy has been emphasized by several researchers (Schunk, 1990; Schunk & Ertmer, 2000).

Zimmerman (2000) enumerates three main features which self-regulated learners possess: they use different self-regulated processes which are purposeful; they enjoy high levels of confidence and self-efficacy; and they set a variety of different goals for themselves. Campbell (1999) suggests three components for any regulatory act which includes (a) 'legislation', means setting rules and goals, (b) 'enforcement', which is something that is exercised against breaking principles and (c) 'adjudication', which refers to decisions made to

see whether or not a violation has occurred as well as taking actions against them (pp.714-715).

In sum, it is through concentrating on learners' beliefs, values and goals that motivation researchers have gained valuable insight as to why some learners prefer to involve themselves more in tasks, whereas others disengage in different activities, and how the above factors contribute to individuals' achievement behaviors (Eccles & Wigfield, 2002).

Schunk and Ertmer (1999) investigated the effect of self-evaluation on students' self-efficacy, achievement outcomes and use of self-regulatory strategies during computer skill learning in two studies. The first one showed that students equipped with process goals could enhance their ability for the implementation of computer-based tasks compared with those learners having product goals. In the second experiment, they reported that process goals and self-evaluation affect achievement outcomes through common mechanism of covering information about learning process. Moreover, Fisher and Baird (2005) explored the impact of social structure in online courses on improving student support and facilitating self-regulation. It was concluded that incorporating web-based collaborative learning assignments into course design can foster community and exert a positive effect on students' independence and self-regulation.

Shea and Bidjerano (2010) examined the relationship between online and blended learning courses and learner self-efficacy and self-regulation; the results showed moderate positive correlations between self-efficacy and collaborative constructs in blended learning and completely online contexts. However, a somewhat lower correlation was observed between self-regulation and cooperative methods in the same context.

In another research, Bernacki, Byrnes and Cromley (2012) studied the effects of achievement goals and self-regulated learning behaviors on reading comprehension in technology-enhanced learning environments. The findings showed that in the light of higher mastery goals, note-taking tended to increase more in mastery learners. These goals, however, had a slight influence on monitoring learning. Some behaviors like highlighting and monitoring also led to intensified comprehension scores. Moreover, certain achievement goals triggered students' self-regulated learning behaviors which, in turn, impacted comprehension of hypertext reading.

In another study, Kuo et al. (2014) investigated student satisfaction in online education. Internet self-efficacy was found to have a considerable effect on student satisfaction and, finally, no correlation was seen between self-regulation and student satisfaction. In other words, self-regulation was not a predictor of satisfaction in learners.

Furthermore, Parker (2015) studied the impact of diagnostic-prescriptive instruction on improving reading comprehension and self-regulated comprehension strategy selection in China. The results showed that students developed more confidence to read advanced texts.

2.3. Critical thinking

For Walsh and Paul (1986), critical thinking implies a skill which is different from intelligence. It is a skill that everyone should strive to improve. Lipman (1988) holds the same opinion, saying that it is more intricate than usual thinking. Critical thinking is the embodiment of a mental strategy which involves a "purposeful, self- regulatory judgment" (Facione, 1990, p. 3). Gokhale (1995) defines critical thinking as "the items that involve analysis, synthesis, and evaluation of the concepts"(p.23). Critical thinking is the capacity by which the learners are able both to read and understand the reading materials at ease and to

interpret, analyze, assess and infer the information which is gathered by means of observation, experience and careful thought (Nosich, 2001).

Naturally, everybody thinks a lot, but not all of our thinking act is excellent. Therefore, it needs to be systematically developed. Cultivated thoughts are commonly mixed with: (a) raising crucial questions and problems as well as exact and clear formulation, (b) accumulating and evaluating related information, (c) coming up with reasonable conclusions and solutions through testing them against pertinent standards, (d) avoiding being narrow-minded, and finally (e) communicating efficiently with others so as to find out best solutions to different problems (Paul & Elder, 2001). Lombard and Grosser (2004) admit that learners need to think critically, which requires the cultivation of critical thinking skills with the help of educators, who have a pivotal role in this regard and are able to think critically by themselves.

Varaki (2006) explored the effectiveness of web-based instruction (WBI) as a tool for teaching courses which need higher order thinking skills and managed to identify some teaching strategies and instructional designs which can promote critical thinking.

In another attempt, Yang and Wu (2012) investigated the effect of Digital Storyteller (DST), as an approach in improving student academic success, critical thinking and learning motivation. DST is a transformative IT integrated instructional strategy which can create a special learning atmosphere for invigorating collaboration. The findings indicated that the participants' English proficiency, motivation and critical thinking improved.

Fahim and Hoominian (2014) examined the relationship between critical thinking ability and reading strategies. The findings of the study didn't justify showed no significant relationship between critical thinking and the overall use of reading strategies. However, there existed a parallelism between the amelioration of critical thinking and the improvement of reading comprehension.

3. Method
3.1 Participants
In the present study, the participants were 171 intermediate level Iranian EFL learners. There were 68 male and 103 female students who were placed at intermediate level based on the written and oral placement tests given to them at the beginning of their registration at a private language institute in Qazvin, Iran. Their age ranged from 16 to 45. Each class or group was randomly assigned to a different treatment.

3.2. Instruments
In this study, the following data collection instruments and materials were utilized:

1) The Michigan Test of English Language Proficiency
2) A Self-regulation Questionnaire
3) A Critical Thinking Questionnaire

The Michigan Test of English Language Proficiency (MTELP) is one of the popular tests for measuring ESL or EFL learners' level of language proficiency. The 100–item multiple-choice test has three parts, containing 40 grammar items, 40 vocabulary items, and reading passages followed by 20 comprehension questions. It was extracted from a Michigan Test booklet (Corrigan, Dobson, Kellman, Span, & Tyma, 1979). To check the reliability of the test, the KR-21 formula was used, and the reliability index turned out to be .79.

Two questionnaires were used to measure self-regulation and critical thinking. These questionnaires were used twice in this study, at the beginning of the course as a pretest and at the end of the course as a posttest. It is worth mentioning that the above-mentioned questionnaires and The Michigan Test of English Language Proficiency (MTELP) have been repeatedly used in foreign and local contexts; however, to ensure their validity, several college professors and English experts were consulted. The two questionnaires which were given to the participants were as follows:

1) A self-regulation questionnaire by Brown, Miller, and Lawendowski (1999) with 63 items on a 5-point Likert scale from 'Strongly Disagree' to 'Strongly Agree'. To estimate the reliability of the questionnaire in the context of this study, Cronbach's alpha was checked, which turned out to be .81.

2) A critical thinking questionnaire with 30 items on a 5-point Likert scale. To estimate the reliability of the questionnaire in the context of this study, Cronbach's alpha was checked, which turned out to be .89.

The instructional materials in the current study were the reading comprehension passages from unit 1 through unit 10 from the intermediate level of 3A and 3B textbooks of the Top Notch series authored by Ascher and Saslow (2011) published by Pearson Education Inc. The reason why the above-mentioned textbook was selected was first its availability and secondly its relevance. In addition, the texts in the book can be easily presented through computer-based programs and the CDs are easy to obtain. Each unit of the textbook under study contained one reading passage on different topics like "The Five Most Effective Work Habits" (p.70), "Holidays Around the World" (p.80), "The Printing Press" (p.94), "Issues in Current World Problems" (p.104), " Clean Energy" (p.118) and so on. An extra number of 5 intermediate reading passages, selected from the internet, were also given to the groups during the treatment sessions.

3.3. Procedure

Initially, the participants with the afore-mentioned characteristics were selected based on cluster sampling. The MTELP was administered to make sure that there were no significant differences among the participants in terms of their language proficiency level. The time allocated to the administration of the test was 90 minutes. During the test administration, the students were not allowed to ask any questions about the items.

Then, the researcher divided the participants into five experimental groups with each group being randomly assigned to one of the treatment conditions: Two Scaffolding groups in conventional and computer-based contexts, two Jigsaw groups again in conventional and computer-based settings, and one Blended learning group. The reason was the fact that in the conventional settings, there is no possibility of designing blended learning.

Before giving each questionnaire, the researcher gave explanation about the questionnaire in Persian to clarify ambiguity and remove anxiety. The students were allowed to ask questions about the questionnaires.

 The allocated time for the self-regulation and critical thinking questionnaires was 30 minutes and 20 minutes, respectively.

Then the treatment began, during which all of the 39 learners in two classes were required to install Telegram application, which is a social network to create groups, and were sent the material to be learned through this application. In the online section, students

benefitted both from their own reading texts available in Top Notch books as well as extra online reading texts. The procedure for blended learning in the computer-based context was as follows:

Step 1: The reading comprehension texts were uploaded to the Telegram groups. This step included sending two reading texts, one from the textbook under study the other as an extra online reading selected from the net. These texts were provided out of the classroom time three or four days before (the 4th, 8th, 12th, 16th, and 20th) face-to-face sessions.

Step 2: The students were asked to review the two texts critically, and analyze the hard words in them before coming to class.

Step 3: Hints were provided on the organization of a paragraph, and the concepts such as 'the key sentence', 'the supporting sentences' and the 'unity of ideas' were clarified. Then, the learners were required to take a look at the texts again and try to identify the main ideas in them.

Step 4: The participants were obliged to write the main idea/ideas of the texts and make 8 to 10 questions for each text and e-mail them to their teachers within two days. They were also asked to answer the multiple-choice or open-ended questions following the texts and send their responses as well.

Step 5: The teachers corrected their responses and graded them.

Step 6: The students and teachers met in a face-to-face class (e.g. sessions 4, 8, 12, 16, & 20). While teaching the reading texts of their course book, the teacher paid more attention to the weak students and took advantage of the strong students to be the leaders in their groups. The correct answers of the questions and the main ideas of the texts were given at the end of face-to-face sessions. The procedure continued until all the 10 reading comprehension texts were presented and practiced through Telegram.

The procedure for Jigsaw was as follows:

Step 1: In the Jigsaw conventional classrooms, the teacher introduced the concept of jigsaw reading comprehension in the first place.

Step 2: The students in each class were divided into 4 to 6 jigsaw groups depending on the number of students in each class and every member in the group was numbered: 1, 2, 3, 4, and so on.

Step 3: The teacher divided the reading passage into five or six segments (depending on the length of the passage) and gave each segment in hard copy to one student in a Jigsaw group. Every learner in each Jigsaw group was asked to read his share of the reading and explore the ideas in that part. Every member was also required to guess whether his part of the text was related to the main idea of the reading, to the body or to the conclusion of the text.

Step 4: After reading the given segments, members from different jigsaw teams (i.e. those who had read similar segments) formed new groups and met to talk about their common topics. They exchanged ideas, and discussed to make sure they had mastered their parts perfectly. They practiced with one another to master the puzzle in such a way to give a summary of that part to their original expert groups. They interacted for almost 10 minutes and became ready for the next step.

Step 5: After learning their own sections, the students reconvened and each group member was asked to make his/her own presentation and teach the related section to the other teammates in the expert group.

Step 6: Finally, there was an assessment of the whole reading passage, which was based on the overall improvement of the groups. The teacher in each class randomly chose one student in every expert group and asked him/her to deliver his/her summary of the text. The score of this student was considered as the final score of that specific expert group.

In computer-based jigsaw context, the condition somehow differed from the conventional context in that the students received pieces of reading texts through their tablets, which were equipped with Telegram application. In fact, this technology was considered as the only channel through which the texts were available for online groups. Similar to the conventional context, the teacher divided the online class into 4 to 6 expert groups. Then, he divided the reading texts into specific parts and assigned each reader to one online part in his expert team. Each member in the group was informed of the name of members in other groups with similar tasks. The similar members of the expert groups who formed the sub-groups had to master their parts and share their ideas with one another.

After learning their own sections, the students came back (joined again) to their original online expert groups and presented their online summaries to the whole group. In the next step, the teacher selected one member in each expert team randomly and wanted him/her to deliver the summary to the whole class and answer some reading comprehension questions for the purpose of evaluation. This procedure was repeated 5 times during the course to cover other reading comprehension passages.

The following procedure was followed in the conventional scaffolding group:

Step 1: To help learners to better tackle the challenging texts and not to lose their interest, pre-teaching vocabulary was done by employing a lexical scaffolding technique known as 'Front-Loading'. The English meanings of some expressions as well as the hard words in contexts for each single passage were given on a sheet of paper to the learners two sessions ahead of teaching each reading comprehension text (five times over the course). Therefore, the teachers served as the students' guides.

Step 2: During the teaching process, the warm-up and tapping into learners' prior knowledge was also done as another scaffolding strategy by asking key questions on the content of the passage and requiring the students to share their ideas and experiences. So, they were expected to relate this information with their own lives; they were also offered sporadic hints to discover the connections and grasp the final message in the texts.

Step 3: Whenever necessary, to clarify the meanings of some words, the teacher used first-language translation by writing the Persian equivalents on the board; this is because using mother tongue orally was strictly forbidden in the institute.

Step 4: Peer scaffolding was encouraged as well. The teachers gave learners time to discuss the new words in small or whole groups to receive positive feedback from their peers and to reduce their stress.

Step 5: Whenever needed, the complicated sections of the texts were paraphrased to pave the way for better comprehension.

For the computer-based group, the words were sent to the learners two or three days before teaching the reading comprehension texts through their Telegram application. Some key questions were also asked on the content of each text to tap into their prior knowledge. Members of each class had enough time to share their knowledge on the topics with their classmates.

Having given the tests and collected the data, the researcher utilized ANCOVA (Analysis of Covariance) to analyze the obtained data and to answer the research questions.

4. Results and Discussion

4.1. Investigation of the First Research Question

The first research question sought to investigate the effects of jigsaw and scaffolding in a conventional context and blended learning on EFL learners' self-regulation. To this end, the first ANCOVA procedure was used. Table 1 shows the results of the descriptive statistics.

Table 1

Descriptive statistics for self-regulation in conventional context

Group	Mean	Std. Deviation	N
Blended learning	191.87	24.219	38
Conventional Jigsaw	196.88	9.854	33
Conventional Scaffolding	192.55	21.080	33
Total	193.67	19.592	104

As Table 1 conventional has the score, the scaffolding blended group. shows, the jigsaw group highest mean followed by conventional and the learning To see whether or not the observed differences between the groups were statistically significant, the ANCOVA procedure was used. The results of the ANCOVA are given in Table 2.

As Table 2 shows, there is no significant difference among groups in the conventional context in terms of learners' self-regulation. Therefore, it can be safely concluded that all the above-mentioned techniques have more or less the same effect on learners' self-regulation.

Table 2

ANCOVA results for self-regulation in conventional context

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1102.937[a]	3	367.646	.957	.416	.028
Intercept	179953.703	1	179953.7	468.240	.000	.824
Self-regulation pre-Test	598.091	1	598.091	1.556	.215	.015
Group	733.464	2	366.732	.954	.389	.019
Error	38431.948	100	384.319			
Total	3940498.000	104				
Corrected Total	39534.885	103				

a. R Squared = .028 (Adjusted R Squared = -.001)

b. Computed using alpha = .05

4.2. Investigation of the Second Research Question

The second ANCOVA procedure was run to investigate the effects of jigsaw and scaffolding in a computer-based context and blended learning on EFL learners' self-regulation. Table 3 summarizes the results of the descriptive statistics.

Table 3
Descriptive statistics for self-regulation in computer-based context

Group	Mean	Std. Deviation	N
Blended Learning	191.87	24.219	38
Computer- based Jigsaw	188.11	25.089	36
Computer- based Scaffolding	193.45	19.908	31
Total	191.05	23.234	105

Based on can be seen computer-scaffolding the highest followed blended group and computer-jigsaw results of ANCOVA are shown in Table 4.

Table 3, it that the based group has mean score, by the learning the based group. The the

Table 4
ANCOVA results for self-regulation in computer-based context

Source	Type II Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	810.235[a]	3	270.07	.493	.688	.014
Intercept	69941.858	1	69941.85	127.676	.000	.558
Self-regulation pre	295.048	1	295.04	.539	.465	.005
Group	513.067	2	256.53	.468	.627	.009
Error	55328.527	101	547.80			
Total	3888554.000	105				
Corrected Total	56138.762	104				

a. R Squared = .014 (Adjusted R Squared = -.015)
b. Computed using alpha = .05

As Table 4 shows, there is no significant difference among groups in the computer-based context in terms of learners' self-regulation. Therefore, it may be claimed that none of these techniques has any differential effect on learners' self-regulation in computer-based context.

4.3. Investigation of the Third Research Question
The third research question investigated the effects of jigsaw and scaffolding in a conventional context and blended learning on EFL learners' critical thinking. The third ANCOVA procedure was used to analyze the participants' scores. The results of the descriptive statistics are summarized in Table 5.

Table 5
Descriptive statistics for critical thinking in conventional context

Group	Mean	Std. Deviation	N
Blended learning	130.74	24.895	38
Conventional Jigsaw	123.61	12.782	33
Conventional Scaffolding	115.09	27.880	33
Total	123.51	23.598	104

As Table 5 shows, the blended learning group has the highest mean score, followed by the conventional jigsaw group and the conventional scaffolding group. To determine whether or not the observed differences between the groups were statistically significant, the ANCOVA procedure was used. The results of the ANCOVA are shown in Table 6.

Table 6
ANCOVA results for critical thinking in conventional context

Source	Type II Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4872.472[a]	3	1624.157	3.095	.030	.085
Intercept	46652.217	1	46652.217	88.889	.000	.471
Critical-thinking pretest	548.456	1	548.456	1.045	.309	.010
Group	3941.525	2	1970.762	3.755	.027	.070
Error	52483.519	100	524.835			
Total	1643837.000	104				
Corrected Total	57355.990	103				

a. R Squared = .014 (Adjusted R Squared = -.015)
b. Computed using alpha = .05

As Table 6 shows, there is a significant difference among groups in terms of critical thinking. Moreover, to see whether or not this observed difference existed among groups prior to treatment, the pre-test critical thinking scores were checked and the results showed no statistical difference. Therefore, the type of treatment has an important effect on critical thinking. Meanwhile, the scores in eta squared column indicated that 7% of the total differences between the groups are due to the type of treatment which was given to them. To locate the differences, pairwise comparisons were made. The results are shown in Table 7. As Table 7 shows, there is no significant difference between the effects of blended learning group and the conventional jigsaw group. Similarly, there is no meaningful difference between the effects of the conventional scaffolding and jigsaw groups. However, a significant difference is seen between the effects of blended learning and the conventional scaffolding groups. Therefore, we can come to the conclusion that the conventional scaffolding technique

is significantly more effective on critical thinking than the conventional jigsaw and the blended learning groups, whereas there is no significant difference between the latter groups.

Table 7
Pairwise Comparisons for critical thinking in conventional context

(I) Group	(J) Group	Mean Difference (I-J)	Sig.[a]
Blended Learning	Conventional Jigsaw	7.056	.199
Blended Learning	Conventional Scaffolding	15.029[*]	.007
Conventional Scaffolding	Conventional Jigsaw	-7.973	.162

    a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).
    *. The mean difference is significant at the .05 level

4.4. Investigation of the Fourth Research Question

The fourth research question investigated the effects of jigsaw and scaffolding in a computer-based context and blended learning on EFL learners' critical thinking. The fourth ANCOVA procedure was used to analyze the participants' scores. The results of the descriptive statistics are summarized in Table 8.

Table 8
Descriptive statistics for critical thinking in computer-based context

Group	Mean	Std. Deviation	N
Blended learning	130.74	24.895	38
Computer- based Jigsaw	116.44	19.462	36
Computer- based Scaffolding	104.84	22.271	31
Total	118.19	24.551	105

According the learning the highest score, followed by the computer-based jigsaw group and the computer-based scaffolding group. To see whether or not the observed differences between the groups were statistically significant, the ANCOVA procedure was used, the results of which are shown in Table 9.

Table 9
ANCOVA results for critical thinking in computer-based context

Source	Type II Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	11802.500[a]	3	3934.167	7.809	.000	.188
Intercept	28998.617	1	28998.617	57.560	.000	.363
Critical thinking	184.760	1	184.760	.367	.546	.004

pre-						
Group	11287.519	2	5643.760	11.202	.000	.182
Error	50883.691	101	503.799			
Total	1529430.000	105				
Corrected Total	62686.190	104				

a. R Squared = .188 (Adjusted R Squared = .164)

b. Computed using alpha = .05

As Table 9 shows, there is a significant difference among groups in terms of their critical thinking. Moreover, to see whether or not this observed difference existed among the groups prior to treatment, the pre-test critical thinking scores were checked and the results showed no statistical difference. Therefore, the type of treatment has an important effect on critical thinking. Meanwhile, the scores in eta squared column indicated that 18.2% of the total differences between the groups are due to the type of treatment which was given to them. To locate the differences, pairwise comparisons were made. The results are shown in Table 10.

Table 10

Pairwise comparisons for critical thinking in computer-based context

(I) Group	(J) Group	Mean Difference (I-J)	Sig.[a]
Blended Learning	Computer- based Jigsaw	14.263[*]	.007
Blended Learning	Computer-based Scaffolding	27.163[*]	.000
Computer-based Scaffolding	Computer- based Jigsaw	-12.900[*]	.031

Table 10 shows that all three mean differences are statistically significant, suggesting that blended learning is more effective on critical thinking than computer-based jigsaw, which is, in turn, significantly more effective than computer-based scaffolding.

4.5. Discussion

The present study explored the effect of instructional techniques like blended learning, the jigsaw, and scaffolding on EFL learners' self-regulation and critical thinking in computer-based and conventional contexts.

Regarding the first and second research questions, results indicated no significant difference among groups in conventional and computer-based contexts in terms of learners' self-regulation. These findings contradict that of Shea and Bidjerano (2010), who showed moderate positive correlations between self-efficacy and collaborative constructs in blended learning and completely online contexts. However, a somewhat lower correlation was observed between self-regulation and cooperative methods in the same context. Also, these findings are in contrast with that of Fisher and Baird (2005), who found that incorporating

web-based collaborative learning assignments into course design is an efficient way to foster community in addition to students' independence and self-regulation.

The third research question showed that the conventional scaffolding technique is significantly more effective on critical thinking than the conventional jigsaw and the blended learning groups. In addition, concerning the fourth research question, in computer-based context, it was observed that blended learning is more effective on critical thinking than computer-based Jigsaw, which is, in turn, significantly more effective than computer-based scaffolding.

A variety of factors may have contributed to the results obtained in this study. One important factor seems to be related to the age of the participants. In most of the previous studies, the participants were adults, who usually prefer isolation in doing learning tasks; however, in the present study, the participants were from among adolescents and young adults, who welcome sharing the tasks and playing with their peers. Therefore, these techniques may have different effects in different age groups.

The number of participants might have had effects on the obtained results. This study was carried out with a relatively small sample of participants (171), whereas in similar investigations like Shea and Bidjerano (2010), the number of the participants was 3165, in Kuo et al. (2014), the number of participants included 291, and in Robertson, Lawdewig, Strickland and Boschung (1987), over 1000 participants took part in the study.

Another significant factor may be learners' level of proficiency. For example, in high-proficiency levels, cooperative learning techniques may be less anxiety-provoking than in low-proficiency levels. In the present study, the participants were all at intermediate proficiency level, while in other studies, the participants were from different proficiency levels.

In addition, the context in which the study was conducted may have influenced the results. Many scholars maintain that in Iranian educational context, which is mainly teacher-centered, many learners are not familiar with the aforementioned skills. So, the obtained results may be due to the students' lack of familiarity or the unpredictability of the cooperative techniques.

Finally, another factor is gender differences which were not taken into account in the present study. However, many researchers like, Ghaith (2003), have shown that there are significant differences between males and females in their perception of cooperative experiences. In other words, gender plays a prominent role in the usefulness of cooperative techniques. This may partially justify the contradictory results obtained in this study.

5. Conclusion

Based on the findings of the present study, we may come up with the conclusion that the aforementioned cooperative learning techniques can be regarded as efficient ways to improve most of the learners-related traits. More specifically, as far as the improvement of learners' critical thinking is concerned, blended learning is more applicable. However, these techniques turned out to be less effective on learners' self-regulation. Therefore, care should be taken in overgeneralizing the effectiveness of all cooperative learning techniques in improving learner-related traits. Education systems and teachers need to avoid being biased towards the application of these techniques because they may not work the same in all circumstances. Bearing this in mind, education systems need to adopt a flexible and eclectic

stance in designing instructional courses and make use of diverse techniques if an ideal instruction is expected.

Since the constructive role of these methods is almost undeniable in improving most of the personal traits, the present study can be of great help to educational systems and policy makers in defining or developing instructional goals. Furthermore, due to the relative ineffectiveness of the present books for the implementation of cooperative techniques, the present study can be beneficial to syllabus designers in that they can develop materials in such a way to incorporate these cooperative techniques to create conditions for higher levels of learning. In addition, teachers themselves can take advantage of the findings of this study by engaging learners in activities that encourage the use of such methods. Moreover, learners can have a better understanding of these techniques and make use of them as strategic ways in the process of their own self-studies.

This study may have theoretical implications as well. It can provide valuable insights for researchers and experts as well as paving the ground for the ongoing studies and shedding light on the dim facets of this field of study.

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