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Exploring EFL Learners' Autonomy in Reading Comprehension: Computer-Assisted Versus Conventional Contexts

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Abstract
This study explored the autonomy of advanced English as a Foreign Language (EFL) learners in reading comprehension through scaffolding and jigsaw in computer-assisted and conventional language learning contexts. After being homogenized through the reading section of the DIALANG proficiency test, 80 female, advanced EFL learners with the age range of 21 to 45 were selected as the participants of the study. They were randomly assigned to four groups; experimental group A (scaffolding in a conventional context), experimental group B (scaffolding in a computer-assisted context), experimental group C (jigsaw in a conventional context), and experimental group D (jigsaw in a computer-assisted context). Next, the autonomy in the reading comprehension (RC) questionnaire, which was designed and piloted by Ebadi and Shirzad (in press), was administered as the pretest. Then, the learners in each group took part in autonomy in reading comprehension training courses for three months (16 sessions). After the treatment, the same autonomy in the RC questionnaire was administered as the posttest. One-way ANCOVA was used to analyze the quantitative data. The results revealed that although both jigsaw and scaffolding approaches were successful in both conventional and computer-assisted contexts from pretest to posttest, the scaffolding method proved more effective. Moreover, both the scaffolding and jigsaw approaches were more effective in the computer-assisted environment compared to conventional contexts, with the scaffolding CA approach outperforming the jigsaw CA technique. The findings' implications for learners, teachers, and syllabus designers are discussed in both contexts.

***Keywords*:** Autonomy in reading comprehension, scaffolding, jigsaw, Computer-assisted Language Learning (CALL), Moodle

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INTRODUCTION

Recently, there has been a noticeable growth of interest in learning autonomy (LA) in general and in language teaching and learning in particular (Borg & Al-Busaidi, 2012; Humphreys & Wyatt, 2014). Al-Araj (2015) states that since reading comprehension proved to be challenging in EFL classrooms, better comprehension can take place when learners act autonomously through social interaction and collaboration in the classroom where teachers need to provide learners with opportunities to become autonomous individuals who are self-motivated and responsible for their learning.

Royanto (2012) states that reading was previously perceived as a completely individualistic skill; yet, this viewpoint was challenged by Vygotsky' (1978) socio-cultural theory of mind (SCT) which underscores reading as a social skill requiring dynamic participation, interaction and engagement of learners (Lantolf, 2006; Remi & Lawrence, 2012). Similarly, Sivasubramaniam (2011) maintains that autonomy, which was so far subject to critique for its focus on the individual learner, is now advocated by the notions of social constructivism that underlines active learning. Little (2012) indicates that learner autonomy is "the product of interdependence rather than independence" (p. 20) which attends to the synergy between whole and individual activities. Consequently, the enhancement of autonomy in reading stems from the combination of social and reflective processes.

Channuan (2012) believes that we cannot teach autonomy, but rather provide opportunities to foster learners' autonomy. Learner autonomy has to be established in an ongoing process through social interactions with teachers and peers. In this process, learners can carry over their autonomy by constructing on the knowledge they have already developed. According to Kessler (2009), autonomous activities enable students to establish a sense of responsibility for the ongoing mediation, extend their ZPD and contribute generally to learning autonomy which involves simultaneous

interdependence and independence through the SCT lens. Scaffolding as an autonomous activity provides the opportunity for learners to take advantage of social interactions with the help of or collaboration with more knowledgeable peers, teachers, and community individuals. Teaching scaffolds improves reading comprehension skills and plays a substantial role in fostering reading to ascertain autonomous comprehension (Sabet, Tahriri, & Pasand, 2013). The impact of scaffolding on the reading comprehension development of EFL learners in groups, and how scaffolding can enhance students' autonomy needs further investigation (Haghparast & Mall-Amiri, 2015).

The next main variable of this study, believed to cultivate learner autonomy in EFL reading comprehension, is the jigsaw technique which was first proposed by Aronson (1978) (Tekbiyik, 2015). Jigsaw is founded on the issue of division of work among the team group members and reinforces positive interdependence and individual accountability. The jigsaw was utilized to instruct reading comprehension in some studies (Komiyama, 2009; Sarobol, 2012; Tekbiyik, 2015; Zuo, 2011) which evidenced its potential in improving learner autonomy, interdependence, and social and linguistic interactive capabilities. Therefore, these instructional techniques (scaffolding and jigsaw) enable learners to assume responsibility for their learning, to build confidence in their capabilities as strategic readers, and to make progress moving from dependence toward interdependence. Learners can create an array of reading strategies and can manage the selection and application of proper strategies as help for strategic and autonomous reading.

In recent years, breakthroughs in technology have made enormous contributions to improving language teaching and learning through which the concepts of scaffolding and jigsaw as autonomy building activities have been redefined and expanded in computer-assisted contexts. Over the past decade, a move toward student-centered and community-based modes of learning led to the development of Moodle (Modular Object-Oriented Dynamic Learning Environment), an instance of Course Management

System (CMS) (www.moodle.org). Moodle has empowered both teachers and learners to have a positive community learning environment to practice teaching and learning activities not just in the classroom but also outside the classroom as well (Ulfiati, Kurniawan, & Failasofah, 2014). Using Moodle, teachers can develop powerful, adaptable, and involving online learning experiences. Employing Moodle in the EFL teaching context aims at developing autonomous learning through injecting culturally appropriate learning practices (Brown, 2007). By creating an online mode of delivery, Moodle leads learners towards learning "beyond the walls" of the classrooms (Brown, 2007, p. 71) and as a result adapts their learning based on their learning style, pace, and time which results in autonomous behavior.

LITERATURE REVIEW

A number of studies have been conducted on the effectiveness of computerized programs in the development of reading comprehension. For example, Beek, Brummer, Donker, and Opdenakker (2018) investigated the efficiency of providing both cognitive and metacognitive scaffolds in computer environments regarding secondary school students' reading comprehension outcomes. The results revealed that scaffolds in computer environments had a positive effect on reading comprehension outcomes. Likewise, Horne (2017) examined the efficiency of a computerized reading comprehension program on the reading accuracy, reading comprehension and reading rate of primary age poor readers. The findings revealed that computerized reading programs can have a positive effect on improving reading skills, and these programs are particularly beneficial for students with reading difficulties in disadvantaged areas, where resources are finite and family support in reading is lower. Moreover, Khezrlou, Ellis, and Sadeghi (2017) analyzed whether explicit, incidental, and intentional learning conditions affected vocabulary acquisition and reading comprehension of students in a multimedia environment. The findings

showed that despite the learning conditions all the groups improved in vocabulary.

A few studies have been conducted on the effect of learner autonomy on reading comprehension, or on the correlation between these two variables. For example, Zarei and Gahremani (2010) tried to examine the correlation between MA students' autonomy and their reading comprehension ability. The results showed that there was a positive relationship between learners' autonomy and reading comprehension ability. Besides, Zafarian and Nemati (2016) examined the effect of learner autonomy on EFL learners' reading comprehension. The results showed that there was a significant positive correlation between learner autonomy and EFL learners' reading comprehension, and revealed that learner autonomy could predict learners' reading comprehension.

Several studies have been conducted on the effect of scaffolding on reading comprehension. For instance, Attarzadeh (2011) attempted to examine the effects of scaffolding on Iranian EFL learners' reading comprehension of various text modes across various proficiency levels. The findings suggested a choice in favor of scaffolded narrative text types for mid-level of learners. The findings showed that scaffolding language has a positive effect on learning reading comprehension. Moreover, Al Eissa and Al-Bargi (2017) aimed to explore the impact of scaffolding strategies on developing reading comprehension skills of female students in Saudi Arabia. The findings revealed that the experimental group outperformed the control group in reading comprehension skills.

Some studies have been conducted on the effect of jigsaw on reading comprehension. For example, Sabbah (2016) attempted to explore the impact of implementing a jigsaw cooperative strategy on ESL students' reading comprehension. The findings of ANCOVA indicated that the experimental group outperformed the control group. In addition, Nasir (2017) attempted to describe the improvement in reading comprehension through the jigsaw model. The findings revealed that the jigsaw model can enhance the quality of learning in reading comprehension both in the

learning outcomes and learning process.

A number of studies have been conducted on the effect of CALL on learner autonomy. For example, Farivar and Rahimi (2015) explored the effectiveness of CALL on Iranian EFL learner's autonomy. The results indicated that the implementation of CALL significantly influenced the development of students' autonomy. Consequently, CALL was found to be efficient in boosting EFL learners' autonomy. Also, Bataineh and Mayyas (2016) examined the effect of Moodle-enhanced instruction on EFL students' reading comprehension and grammar performance in Jordan. The results showed that the students receiving moodle-enhanced instruction improved in both reading comprehension and grammar.

To the best knowledge of the writers, no published study has ever explored EFL learners' autonomy in reading comprehension through instructional techniques of scaffolding and jigsaw in different contexts of computer-assisted and conventional contexts in a single study. Therefore, this study attempted to fill this gap in the literature.

PURPOSE OF THE STUDY

The primary purpose of this quasi-experimental study is to compare Iranian advanced EFL learners' autonomy in reading comprehension after receiving scaffolding and jigsaw instructional techniques in computer-assisted and conventional contexts. The following research hypotheses guided this study:

H_{01}: There is not any significant difference between scaffolding and jigsaw in terms of their effect on the autonomy of L2 learners in a conventional context.

H_{02}: There is not any significant difference between scaffolding and jigsaw in terms of their effect on the autonomy of L2 learners in a computer-assisted context.

H_{03}: There is not any significant difference between scaffolding and jigsaw in terms of their effect on the autonomy of L2 learners in

conventional and computer-assisted contexts.

METHOD

Participants

A total of 150 female advanced EFL learners were selected non-randomly through convenient sampling from two famous language institutes in Urmia, Iran. Their age ranged from 21-45. To ensure the homogeneity of the participants in terms of language proficiency (advanced level), the reading section of DIALANG proficiency test was administered to the participants. The outcome was 80 advanced EFL learners. Next, they were randomly assigned to four groups: experimental group A (scaffolding in a conventional context), experimental group B (scaffolding in a computer-assisted context), experimental group C (jigsaw in a conventional context), and experimental group D (jigsaw in a computer-assisted context).

Instrumentation

Autonomy in RC Questionnaire

The autonomy in the RC questionnaire developed by Ebadi and Shirzad (in press) was used as the pretest and posttest to assess the participants' autonomy in reading comprehension as it is the only autonomy in reading comprehension questionnaire (see appendix A). Since there was no available questionnaire exploring learner autonomy in reading comprehension in the EFL educational context, Ebadi and Shirzad (in press) aimed to develop and validate a learner autonomy questionnaire in reading comprehension whose items were specific to EFL context to obtain a more detailed view of its components. Reviewing the existing literature and investigating EFL experts' perspectives led to the development of a five-component model of learner autonomy in EFL reading comprehension which was then piloted and tested through exploratory and confirmatory data analyses on a sample of 280 EFL learners. The results indicated the

reliability of 0.92 and an acceptable validity. These results sought a more substantial interpretation of the concept of learner autonomy in reading comprehension concerning the EFL context and offered new insights for higher education administrators. This questionnaire addresses the following five components: Cognitive (six items), metacognitive (eight items), action-oriented (six items), affective (four items), and social (six items). It includes thirty items on a five-point Likert scale ranging from "Strongly Disagree", "Disagree", "Neutral", "Agree" and "Strongly Agree". The EFL learners were supposed to indicate the extent to which each item applied to them on a Likert-scale of one to five, respectively. Four items of the questionnaire are in reverse order to make sure the participants answer the items carefully.

Moodle

In this study, Moodle version 3.5 was utilized and various spare plugins were installed to uplift the capabilities. A Moodle site was developed at http://f-shirzad.ir to integrate reading comprehension materials into Moodle and to supplement conventional face-to-face classrooms. The reading materials were utilized to allow the students to improve their learning outside the classrooms by offering more sources and practices which they could access anywhere, anytime, and at their own pace. This, in turn, was expected not only to improve their reading skills but also their autonomy in reading.

As a supplement to the face-to-face class, this Moodle course supplied students with reading comprehension skills particularly in facing TOEFL and IELTS reading tests. Therefore, the materials given in the Moodle were geared towards the skills commonly found in the tests, such as finding main ideas and topics of a text, finding details, making inferences, etc. The materials were extracted from manifold sources such as textbooks, newspapers, magazines, online articles with disparate relevant topics. Through providing various activities related to reading comprehension

skills, such sources were expected to allow the students to get familiar with authentic texts to boost their learning experiences.

Data Collection Procedure

After selecting 150 female, advanced EFL learners from two famous language institutes in Urmia, Iran, and administering the reading section of DIALANG proficiency test to homogenize the sample, 80 participants who demonstrated advanced proficiency in English (Levels C1-C2) were selected as the final sample of the study. Next, the participants were randomly assigned to four groups: experimental group A (scaffolding in a conventional context), experimental group B (scaffolding in a computer-assisted context), experimental group C (jigsaw in a conventional context), and experimental group D (jigsaw in a computer-assisted context). Then, the piloted and validated researcher-made autonomy questionnaire was administered as the pretest. The participants were informed that the questions were intended to measure their autonomy in reading comprehension, and were advised to give honest answers to the questions. They were also told to be fair to themselves, not to overrate or underrate themselves and to describe themselves just as they are. To encourage the students to answer more carefully, they were promised to be given their scores anonymously and the results would be used solely for the research purposes and that it would be kept confidential. They were also told that the questionnaires which were filled out honestly would assist them to know more about their autonomy level in reading comprehension.

All four groups had 16 sessions of autonomous reading comprehension training courses. The majority of training course reading topics centered on subjects related to the TOEFL test.

Scaffolding technique was used as the treatment in the experimental groups A and B. The teacher provided scaffolds that guided, stepped back and observed what students did, continuously assessed how well instruction was sticking, and gradually released responsibility to the student. In other

words, the teacher provided high levels of initial, deliberate, and well-planned support, and gradually reduced this as the students moved towards independent control of the reading activity. However, it was the teacher's responsibility to watch and decide when and how much support and help was needed since scaffolding can be a moment-to-moment help (Davis & Miyake, 2004).

The following structure of scaffolded instruction was followed:

First, the instructor performed it: (The teacher did/the students watched). In other words, the instructor modeled how to answer specific types of TOEFL reading comprehension questions, such as factual information, negative factual, inference questions, rhetorical purpose questions, and reference.

Second, the class performed it: (The teacher did/the students helped). The instructor and the students worked together to answer specific types of TOEFL reading comprehension questions. The teacher provided supported practice via prompts and cues to ensure correct performance.

Third, the group performed it: (The students did/the teacher helped). The students worked with a partner or a small cooperative group to answer specific types of TOEFL reading comprehension questions. Cooperative teams performed the skill together and provided the needed support for each other.

Fourth, the individual performed it: (The students did/the teacher watched). This was the independent practice stage where individual students practiced the skill independently without external assistance.

The teacher scaffolds various techniques of support such as models, cues, prompts, hints, partial solutions, think-aloud modeling, and direct instruction.

Jigsaw technique was used as the treatment in the experimental groups C and D. The students in each experimental group were divided into 5 jigsaw groups, and every member in the group was numbered: 1, 2, 3 and 4. Each session the teacher divided the reading passage into 4 segments and gave each segment in hard copy to one student in a jigsaw group. Every

learner in each jigsaw group was asked to read her share of the reading and to underline important information, to jot down notes, create a summary of key points or draw a concept map. Every member was also required to guess whether her part of the text was related to the main idea of the reading, to the body or the conclusion of the text. After reading the given segments, members from different jigsaw teams (i.e. those who had read similar segments) formed Expert groups and met to talk about their common topics. They exchanged ideas, cleared up questions and discussed to make sure they have 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 jigsaw groups. They interacted for almost 10 minutes and became ready for the next step. After learning their sections, the students reconvened and each group member was obliged to make her presentation and teach the related section to the other teammates in the jigsaw group trying to make them understand that segment and to combine all parts to achieve integrity. Finally, there had to answer specific types of TOEFL reading comprehension questions, such as factual information, negative factual, inference questions, rhetorical purpose questions, and reference. The teacher in each class randomly chose one student in every jigsaw group and required her to answer one of the questions. The score of this student was considered as the final score of that specific jigsaw group. The group (or groups) who had the highest average group improvement score received a better class activity mark. Fortunately, each student took responsibility for reading her given segment and teaching it to the other learners. Smith (2008) defines autonomous language learners as those who take charge of the totality of their learning situation. They first determine their own goals; then, they define the content to be learned as well as the progression of the course; next, the methods and techniques to be utilized are chosen; then, this procedure is monitored; and, finally, the acquisition is evaluated.

Experimental groups A and C received their treatments in a traditional classroom context, whereas experimental groups B and D received

treatment in a language laboratory equipped with ceiling cameras, computers with ZD Soft Screen Recorder, and headsets for each student. Moodle software, which is an open-source interactive software, was utilized to help the teacher create a collaborative and interactive learning environment for students' reading comprehension. In the lab, the teacher was able to interact with the students via the teacher's console. Participants were able to access Moodle by using their account usernames and passwords. At the onset of the treatment, the teacher organized a Moodle tutorial for the participants of the group, and she was always on hand for both academic and technical support. She accessed Moodle at least twice a day to answer questions, check students' logs and Moodle-related activities, thank active students, and urge less active ones to participate. The groups B and D had unlimited access to the Moodle inside and outside the classroom and were provided with covered content posted on Moodle to supplement in-class classroom instruction. Throughout all sessions in experimental groups, the instructor tried to give some examples to EFL learners and to reinforce the EFL learners' confidence in their ability to read autonomously.

After administrating the 16 sessions of the autonomous reading comprehension training course, the autonomy in the RC questionnaire for the Iranian EFL context was administered to the participants in four groups. The administration of the developed autonomy in the RC questionnaire was done for the sake of comparing the autonomy of EFL learners in reading comprehension in four groups.

Data Analysis

To verify or reject the null hypotheses of this study, a statistical procedure known as analysis of covariance (ANCOVA) was used. Prior to the inferential data analysis, the assumptions for the use of ANCOVA including normality of distribution, linearity, and homogeneity of regression slopes were tested. Normality was checked both graphically and

statistically.

RESULTS

Results of Investigating the First Null Hypothesis

In order to investigate whether there is a significant difference between scaffolding and jigsaw in terms of their effect on the autonomy of L2 learners in a conventional context, initially the Kolmogorov-Smirnov test was run to test the normal distribution of the data. The results are demonstrated in Table 1.

Table 1: Kolmogorov-Smirnov test results

		pretest	posttest
N		80	80
Normal Parameters[a]	Mean	56.3250	67.5125
	Std. Deviation	15.70114	17.17445
Most Extreme Differences	Absolute	.111	.128
	Positive	.111	.128
	Negative	-.082	-.062
Kolmogorov-Smirnov Z		.995	1.145
Asymp. Sig. (2-tailed)		.276	.145

a. Test distribution is normal.

After ensuring the normality of data using the Kolmogorov-Smirnov test ($p > .05$), a one-way ANOVA was run to examine pretest differences among the groups. Results are reported in Tables 2 and 3.

Table 2: Descriptive statistics for pretest scores of conventional groups

	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean	Min.	Max.

					Lower Bound	Upper Bound		
Scaffolding	20	58.6000	12.24487	2.73804	52.8692	64.3308	37.00	83.00
Jigsaw	20	56.9000	18.75858	4.19455	48.1207	65.6793	33.00	87.00
Total	40	57.7500	15.65944	2.47597	52.7419	62.7581	33.00	87.00

Table 3: ANOVA results for pretest scores of conventional groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.900	1	28.900	.115	.736
Within Groups	9534.600	38	250.911		
Total	9563.500	39			

As Table 3 shows, there were insignificant differences between the jigsaw and scaffolding groups in terms of their pretest performance, $F(1, 38) = .11$, $p = .73$.

Subsequently, a one-way analysis of covariance (ANCOVA) was carried out to compare participants' progress from pretest to posttest. Firstly, the major assumptions of ANCOVA were ensured. One of the major assumptions of ANCOVA is the homogeneity of variances; as a result, Levene's test was applied. The homogeneity of variance assumption ($F = 9.36$, $p = .114$) was confirmed by approving the conduction of ANCOVA. In addition, the homogeneity of regression slopes was confirmed through the following figure and the linearity assumption was found to be .23.

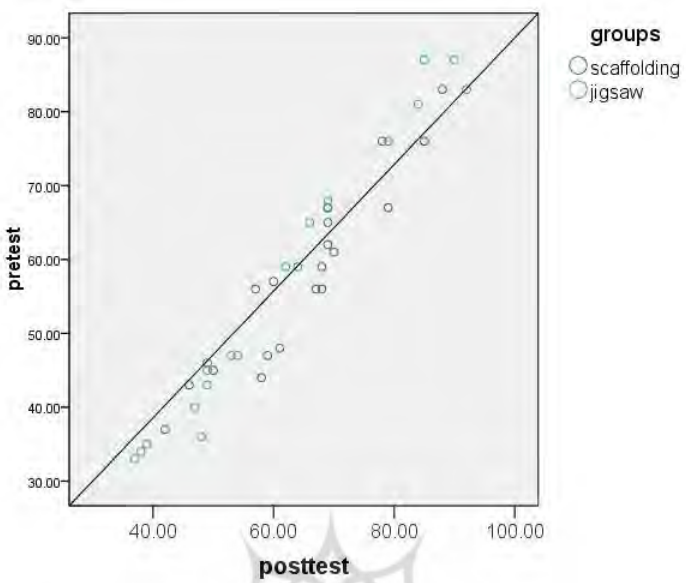

Figure 1: Homogeneity of regression slopes and linearity for conventional groups

Results of the descriptive statistics for the jigsaw and scaffolding groups' differences in the conventional environment are depicted in Table 4.

Table 4: Descriptive statistics results for conventional groups' posttest performance

Groups	Mean	Std. Deviation	N
Scaffolding	65.6000	11.92697	20
Jigsaw	61.1500	17.61063	20
Total	63.3750	15.01570	40

According to Table 4, the scaffolding group learners (M = 65.60, SD = 11.92) outperformed the jigsaw group (M = 61.15, M = 17.61) in terms of posttest autonomy performance. In order to ascertain the group differences, an ANCOVA was carried out, the results of which are reported in Table 5.

Table 5: ANCOVA Results for conventional groups' posttest performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8320.207[a]	2	4160.104	325.305	.000	.946
Intercept	270.771	1	270.771	21.173	.000	.364
Pretest	8122.182	1	8122.182	635.125	.000	.945
Groups	82.748	1	82.748	6.471	.015	.149
Error	473.168	37	12.788			
Total	169449.000	40				
Corrected Total	8793.375	39				

a. R Squared = .946
(Adjusted R Squared = .943)

The results are further illustrated in Figure 2.

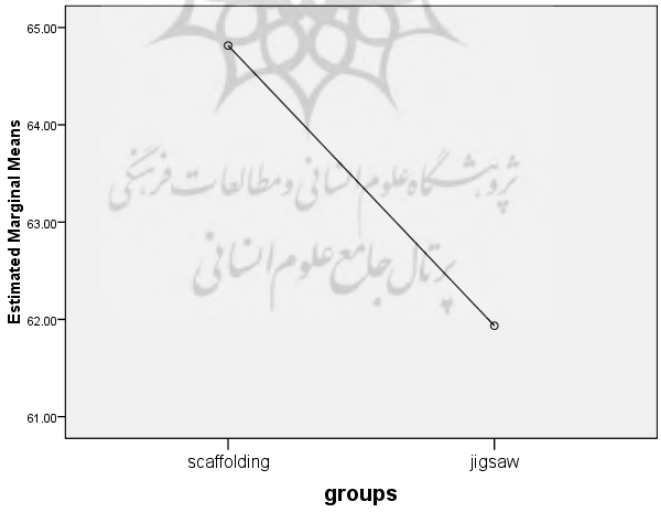

Figure 2: Group differences in a conventional environment

As the results of Table 5 indicate, there was a significant main effect for group, $F(1, 39) = 6.47$, $p = .01$, demonstrating the superiority of the scaffolding group over jigsaw group according to the results of the descriptive statistics. Furthermore, there was a significant pretest effect, $F(1, 39) = 635.12$, $p = .000$, verifying the improvement of both groups from pretest to posttest. Therefore, the first null hypothesis claiming a non-significant difference between the groups in the conventional context regarding autonomy is rejected.

Results of Investigating the Second Null Hypothesis

For the second null hypothesis concerned with whether there is a significant difference between scaffolding and jigsaw in terms of their effect on the autonomy of L2 learners in a computer-assisted context, a one-way ANCOVA was performed. First, the results of one-way ANOVA for pretest scores are presented in Tables 6 and 7.

Table 6: Descriptive statistics for pretest scores of computer-assisted groups

	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Scaffolding	20	54.30	16.899	3.778	46.39	62.20	34.00	82.00
Jigsaw	20	55.50	15.059	3.367	48.45	62.54	34.00	82.00
Total	40	54.90	15.811	2.499	49.84	59.95	34.00	82.00

Table 7: ANOVA results for pretest scores of computer-assisted groups

	Sum of Squares	df	Mean Square	F	Sig.

Between Groups	14.400	1	14.400	.056	.814
Within Groups	9735.200	38	256.189		
Total	9749.600	39			

As Table 7 shows, there were non-significant differences between the jigsaw and scaffolding groups in terms of their pretest performance, $F(1, 38) = .05$, $p = .81$.

Subsequently, a one-way ANCOVA was carried out in order to compare participants' progress from pre-test to post-test. Firstly, the major assumptions of ANCOVA were ensured. One of the major assumptions of ANCOVA is the homogeneity of variances; as a result, Levene's test was applied. The homogeneity of variance assumption ($F = .01$, $p = .92$) was confirmed by approving the conduction of ANCOVA. In addition, the homogeneity of regression slopes was confirmed through the following figure and the linearity assumption was found to be .17.

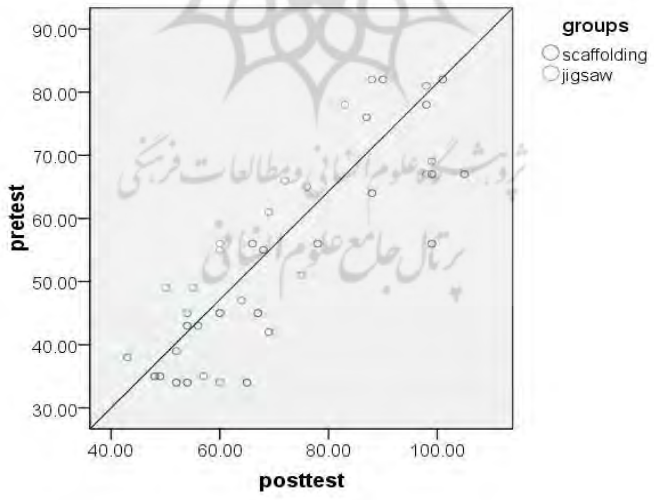

Figure 3: Homogeneity of regression slopes and linearity for computer-assisted groups

The results of the descriptive statistics are presented in Table 8.

Table 8: Descriptive statistics results for computer-assisted groups' posttest performance

Groups	Mean	Std. Deviation	N
Scaffolding	74.8500	19.43214	20
Jigsaw	68.4500	17.09871	20
Total	71.6500	18.35484	40

The results of Table 8 refer to the clear superiority of the scaffolding group (M = 74.85, SD = 19.43) over the jigsaw group (M = 68.45, SD = 17.09) regarding posttest scores. Results of ANCOVA are presented in table 9.

Table 9: ANCOVA results for computer-assisted groups' posttest performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	9763.018[a]	2	4881.509	53.499	.000	.743
Intercept	950.893	1	950.893	10.421	.003	.220
Pretest	9353.418	1	9353.418	102.508	.000	.735
Groups	573.146	1	573.146	6.281	.017	.145
Error	3376.082	37	91.245			
Total	218488.000	40				
Corrected Total	13139.100	39				

a. R Squared = .743 (Adjusted R Squared = .729)

The results are schematically presented in Figure 4.

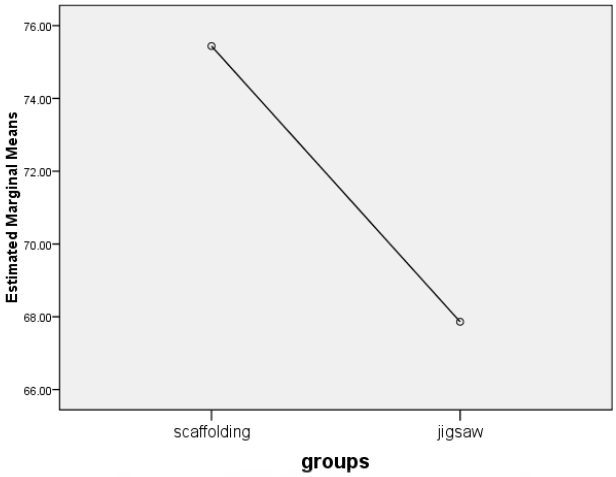

Figure 4: Group differences in a computer-assisted environment

As the results of Table 9 indicate, there was a significant main effect for group, $F(1, 39) = 6.28$, $p = .01$, demonstrating the superiority of experimental group over control group according to the results of the descriptive statistics. Furthermore, the existence of a significant pretest effect, $F(1, 39) = 102.50$, $p = .000$, indicates the increase of scores from pretest to posttest for both groups. Consequently, the second null hypothesis is rejected.

Results of Investigating the Third Null Hypothesis

For the third null hypothesis that examined the scaffolding and jigsaw groups in both conventional and computer-assisted environments, a one-way ANCOVA was run. Similar to previous research questions, first a one-way ANOVA was performed for the pretest scores (Tables 10 and 11).

Table 10: Descriptive statistics for pretest scores of both conventional and computer-assisted groups

	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
scaffolding CA	20	54.3000	16.89939	3.77882	46.3908	62.2092	34.00	82.00
jigsaw CA	20	55.5000	15.05953	3.36741	48.4519	62.5481	34.00	82.00
scaffolding C	20	58.6000	12.24487	2.73804	52.8692	64.3308	37.00	83.00
jigsaw C	20	56.9000	18.75858	4.19455	48.1207	65.6793	33.00	87.00
Total	80	56.3250	15.70114	1.75544	52.8309	59.8191	33.00	87.00

Note. CA = computer assisted, C = conventional

Table 11: ANOVA results for pretest scores of both conventional and computer-assisted groups

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	205.750	3	68.583	.270	.846
Within Groups	19269.800	76	253.550		
Total	19475.550	79			

As Table 11 indicates, there were non-significant differences between the jigsaw and scaffolding groups in terms of their pretest performance, $F(3, 79) = .27$, $p = .84$.

A one-way ANCOVA was carried out in order to compare participants' progress from pre-test to post-test. Levene's test ensured the homogeneity of variance assumption ($F = 9.68$, $p = .15$) was confirmed by approving the conduction of ANCOVA. In addition, the homogeneity of regression slopes was confirmed through the following figure and the linearity assumption was found to be .10.

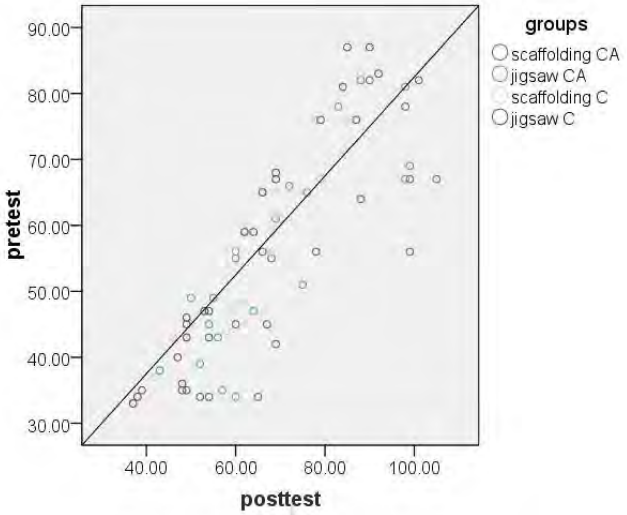

Figure 5: Homogeneity of regression slopes and linearity for both conventional and computer-assisted groups

The results of the descriptive statistics are presented in Table 12.

Table 12: Descriptive statistics results for both conventional and computer-assisted groups' posttest performance

Groups	Mean	Std. Deviation	N
scaffolding CA	74.8500	19.43214	20
jigsaw CA	68.4500	17.09871	20
scaffolding C	65.6000	11.92697	20
jigsaw C	61.1500	17.61063	20
Total	67.5125	17.17445	80

Note. CA = computer assisted, C = conventional

The results of Table 12 refer to the superiority of the scaffolding CA group (M = 74.85, SD = 19.43) over the jigsaw CA group (M = 68.45, SD = 17.09) in the CA environment followed by the scaffolding C group (M = 65.60, SD = 11.92) over the jigsaw C group (M = 61.15, SD = 17.61) in the

C environment regarding posttest scores. The results of the ANCOVA are presented in Table 13.

Table 13: ANCOVA results for both conventional and computer-assisted groups' posttest performance

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	19436.961[a]	4	4859.240	94.293	.000	.834
Intercept	1090.424	1	1090.424	21.159	.000	.220
Pretest	17459.823	1	17459.823	338.804	.000	.819
Groups	3040.747	3	1013.582	19.668	.000	.440
Error	3865.027	75	51.534			
Total	387937.000	80				
Corrected Total	23301.988	79				

a. R Squared = .834 (Adjusted R Squared = .825)

As the results of Table 13 indicate, there was a significant main effect for group, $F(3, 79) = 19.66$, $p = .000$, and for pretest, $F(1, 79) = 338.80$, $p = .000$. Furthermore, the results of the Bonferroni post-hoc test revealed significant differences between all group comparisons ($p < .05$). Consequently, the third null hypothesis claiming a non-significant difference between the jigsaw and scaffolding groups in the conventional and computer-assisted environment concerning autonomy is rejected. The results are schematically presented in Figure 6.

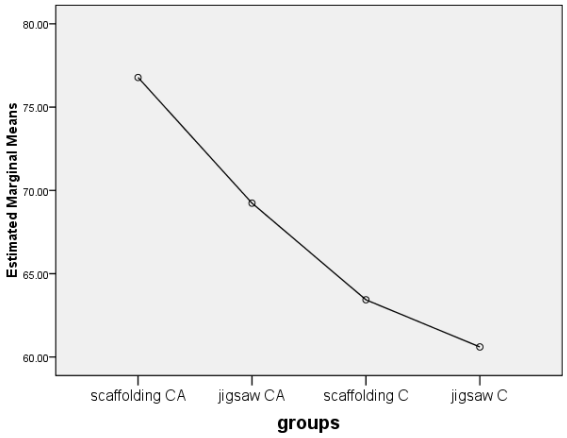

Figure 6: Group differences in both conventional and computer-assisted environments

DISCUSSION

The present study aimed at enabling learners to read autonomously using a Moodle program. With regard to the first and second null hypotheses, the analysis revealed that although both jigsaw and scaffolding approaches were successful in both conventional and computer-assisted contexts from pre-test to post-test, the scaffolding method proved more effective. This finding is in line with the results of the previous studies (Chang, Sung, & Chen, 2001; Khezrlou, 2018; Khezrlou et al., 2017; Li, 2010; Paas, 1992). These studies have depicted the prominent role of scaffolding in a computer-assisted environment in significantly enhancing the reading comprehension of learners. The efficiency of the scaffolding context might be attributed to the declined workload of the scaffold aids provided by knowledgeable peers. Paas (1992) recommended that to prevent a possible overload on learners, a 'completion strategy' (similar to the 'construct-on-scaffold' method) is an effective way of offering learning materials. However, to a less extent, the jigsaw approach was also found effective in increasing learners' level of comprehension. Findings of the previous

research have also indicated positive effects of jigsaw on reading comprehension (Azmin, 2016; Gambari & Yusuf, 2016; Lai & Wu, 2006) compared to individualistic and conventional teaching strategy. Nevertheless, these findings contradict previous research (e.g., Ross, Seaborn, & Wilson, 2002; Şengül & Katranci, 2014; Shaaban, 2006; Thompson & Pledger, 1998) in which significant differences in the achievement of learners taught using Jigsaw and those taught using conventional classroom approach were not reported.

Regarding the third null hypothesis, the findings revealed that both the scaffolding and jigsaw approaches were more effective in the computer-assisted environment compared to conventional contexts, with the scaffolding CA approach outperforming the jigsaw CA technique. The success of computer-assisted Jigsaw strategy in comparison to conventional strategy originates from the fact that it was considered as a task structured (task specialization) and incentive structured (group prizes for personal learning, group prize for group outcome, and individual prizes) cooperative approach which included both individual and group work. However, its less effectiveness compared to the scaffolding strategy might be explained concerning the complexities of its appropriate application. For instance, it is possible that not all members of a team would attempt to learn the whole lesson in the homegroup or learn their parts in the jigsaw group. Probably, learners might have been familiarized with the jigsaw more than the scaffolding group to attain better results.

The results of data analysis are more aligned with theories that perceive reading comprehension either as a collective social activity within which responses and feedback are important or as recursive, nonlinear mental strategies that have effects on students' cognitive and metacognitive knowledge. These effects become greater especially when students receive feedback responses from peers and teachers alongside the learning task. From the perspective of the sociocultural theory, similar to Lave and Wenger's (1991) concept of community of practice, other researchers' understanding, such as Vygotsky's (1978) and Auerbach's (1999), of the

concept of sociocultural approach in which they state that successful learning, teaching, and learning has to become a dialogic activity with collaborative and cooperative techniques in teaching. In other words, without support from teachers and students' scaffolding and help, learning could not occur effectively.

Also, the results of this study are in line with the framework of the cognitive learning theory (Alao & Guthrie, 1999) which postulates that scaffolding and jigsaw would bring the curriculum into a new era of teaching and learning by providing students with higher rate of social interaction with other individuals, both within and outside their school contexts–more than what they usually experience in their classroom environment (Larson & Marsh, 2005). The consistency with the framework is reflected in students' responses received from their teacher. The first possible factor can be linked to the cognitive learning theoretical framework's perception that individuals are active learners who initiate experiences, seek out information to solve problems, and reorganize prior knowledge to achieve new insights (Turner, Husman, & Schallert, 2002).

CONCLUSION AND IMPLICATIONS

The findings of the study will likely enable EFL instructors and syllabus designers to help their learners by identifying their autonomy in reading comprehension and utilizing scaffolding and jigsaw in computer-assisted contexts in the process of teaching and learning autonomy in reading comprehension. The findings will also help Iranian EFL instructors to become aware that their students are different and deserve different treatment in the case of their autonomy in reading comprehension.

It is believed that instructing techniques to improve learners' autonomy in reading comprehension should be given the same priority as other language skills in the EFL context. As autonomy is related to the behaviors and personality of learners, it could have an important role in the application and use of the approaches and methodologies in EFL reading

comprehension. Conflicting with learners' natural anticipation that learner autonomy in reading comprehension needs working independently from others, they may gain a higher level of autonomy in reading comprehension if they get engaged in cooperative learning activities. This might be partly due to higher levels of self-confidence they may gain in cooperative computer-assisted contexts. However, learners should be encouraged to collaborate to accomplish higher levels of autonomy in reading comprehension. Nowadays, many educational contexts sought for learner autonomy in reading comprehension; thus, there is a need to alter the competitive teaching techniques to cooperative teaching techniques. That is, teachers are required to be familiarized with cooperative teaching techniques. Besides, syllabus designers and those involved in materials preparation and development are required to change the nature of the activities in books to have more cooperative activities and aspire learners to work cooperatively. In this case, course books can also act as agents of change, pushing teachers – naturally resistant to change – to adopt teaching techniques that need cooperative work.

This study probed the effects of two cooperative techniques (jigsaw and scaffolding) on learners' autonomy in both contexts, further studies can be conducted on other cooperative techniques such as blended learning, think-pair-share, reverse jigsaw, and reciprocal teaching, Moreover, the focus of this study was on advanced students. Therefore, to support the effectiveness of the above techniques on learners at different proficiency levels, more research can be done.

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Appendix: Autonomy in the RC Questionnaire

Name:

Please take a few minutes of your time to fill out the following questionnaire. There are no "correct" answers. Simply answer each question based on your experience. All the information collected will be confidential and will be used for

research only. Your opinion is very important. Thank you for your cooperation. Based on your experience, please check the most appropriate answer to each question.

1. Strongly Disagree 2. Disagree 3. Neutral
4. Agree 5. Strongly Agree

No.	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I think I have the ability to comprehend English texts well.					
2	I think I have the confidence to ignore difficult words while reading.					
3	I think collaboration with my classmates helps to improve my level of reading comprehension.					
4	Outside of assignments given by the teacher, I have a clear plan for reading extensively on my own.					
5	Outside of class, I take advantage of various opportunities to read English texts.					
6	I like trying new techniques while reading English					

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	texts.					
7	It is difficult for me to put newly learned English reading techniques into practice.					
8	I can consciously employ effective strategies to improve my reading comprehension.					
9	I can consciously monitor the usage of reading strategies during practice.					
10	I select effective methods to become a better reader, such as reading English newspapers, magazines, novels, etc.					
11	I am conscious of whether or not my method of reading is practical.					
12	If I realize that my method of reading is impractical, I quickly find a more suitable one.					
13	I am able to find problems in my method of reading.					
14	If I find problems in my method of					

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	reading, I am able to solve them.					
15	In English reading courses, I try activities in which I can read on my own.					
16	During the class, I try to catch chances to take part in activities such as pair/group discussion, etc.					
17	When reading English texts, I set practical goals for myself based on my true English reading level.					
18	It is difficult for me to create a practical reading schedule for myself.					
19	I am good at adjusting my reading plans based on my progress.					
20	During the process of completing a certain English learning task, I keep in line with my predetermined plan.					
21	I make an effort to overcome emotional issues that may hinder my English reading studies,					

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	such as shyness, anxiety, inhibition, etc.					
22	I use available learning resources such as the library, the internet, dictionaries, etc. to improve my English reading.					
23	I often study together with other people, e.g. practicing with a language partner, or practicing and reviewing materials with classmates.					
24	I am able to answer most of the reading comprehension questions without any problem.					
25	When I have difficulty in answering a reading comprehension question, I get help from others.					
26	When I discover my mistakes in reading comprehension, I understand the underlying reason for making them.					
27	I know my strengths and weaknesses in my English reading.					

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28	I choose books which suit me, neither too difficult nor too easy.					
29	I can assess my own reading progress.					
30	I exchange ideas with my friends on how to comprehend a reading text better.					

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