Peer/Teacher Technology-Enhanced Scaffolding through Process Approach and Iranian EFL Learners' Vocabulary Knowledge: A Probe into Self-regulation

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Abstract

The present study aimed at investigating the effect of peer and teacher scaffolding through a process approach in a technology-enhanced environment on vocabulary learning among high and low self-regulated learners. Participants of the study were 120 English as a Foreign Language (EFL) learners who were selected based on their scores on a sample copy of the Oxford Placement Test (OPT). The participants were divided into three groups each consisting of 40 learners. One group of the participants received peer scaffolding; the second group was exposed to teacher scaffolding via the Telegram app based on process approach principles, while the third group served as the control group. The control group received conventional vocabulary teaching in such a way that the Telegram app was not employed. The learners in the control group were also provided with vocabulary exercises in the vocabulary book *(English Vocabulary in Use)*. Data were collected through a sample copy of OPT, a vocabulary test, and a self-regulation questionnaire. The results of a one-way ANOVA revealed that both peer and teacher scaffolding significantly affected vocabulary learning. However, there was no significant difference between peer and teacher scaffolding in terms of their effects on vocabulary learning. The results of a two-way ANOVA indicated that the main effect of treatment on vocabulary learning was significant; however, there was no statistically significant difference between the effects of the two treatment modalities on students' vocabulary learning.

Vocabulary learning plays an important role in EFL contexts. Similarly, a review of the related literature (e.g., Agustín-Llach, 2015; Alipour, Madarsara, Youhanaee, &Barati, 2015; Arast, &Gorjian, 2016; Ertürk, 2016; Ghanbari, &Marzban, 2014) indicates that vocabulary is viewed as the most important element in the second language (L2) teaching and learning. There is a consensus among second language learners and teachers that foreign language learning is concerned with the acquisition of new vocabulary (Walters, 2004). Highlighted by scholars working on second language acquisition, vocabulary acquisition is viewed as an essential dimension in second language learning and teaching (Knight, 1994). Furthermore, as Schmitt (2008) asserts, vocabulary learning is a crucial component involved in mastering an L2. According to Wilkins (1972), individuals would fail to impart much as long as they have no knowledge of grammar. However, with no knowledge of vocabulary, nothing can be imparted. As discussed by Brown and Payne (1994, p. 7), the learners should undergo five steps to learn new vocabulary items while learning an L2. These five steps are:

- coming up with new words
- knowing the word form
- figuring out the word meaning
- establishing a connection between word form and meaning in memory
- making use of the word

The research carried out by scholars including Meara (1980) revealed a consensus among teachers and students that the acquisition and memorization of a large number of vocabulary items create the main challenge to L2 learners. According to Decarrico (2001), vocabulary learning is of enormous importance in language acquisition (second language, foreign language). A review of recent empirical studies (e.g., Bouhnik & Deshen, 2014; Do digovic,

2005; Ghaemi & Seyed Golshan, 2017; Ghobadi & Taki, 2018; Heidari Tabrizi & Onvani, 2017; Mashhadi Heidar & Kaviani, 2016) indicates that the advent of technology has led to the emergence of innovations in vocabulary teaching and learning.

Nowadays, students are growing up in a world replete with technological devices including computers and mobile phones (Bouhnik & Deshen, 2014). Due to the prevalence of computers and mobile phones, the use of such technological devices has been on the rise for educational purposes in general and language learning purposes in particular. These days a significant portion of social communications is transpiring online and many instances of social media are used by people in educational settings (Ghobadi & Taki, 2018). Similarly, language learners also employ social media to communicate using both the first and second languages to varying degrees (Calvo, Arbiol, & Iglesias, 2014).Kaplan and Haenlein (2010, p. 61) define social media as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content". Telegram is one of these "web-based applications" which was launched in 2013 (Ghobadi & Taki, 2018, p. 140).

The Telegram account is accessible from various devices, and the sent files and messages can appear on all devices simultaneously (Ebrahimi, Hajebrahimi, Nikfallah, Sari-Motlagh & Shakiba, 2016). The Iranian people use this social network application more often compared to other social networks because of its accessibility and user-friendliness (Mashhadi Heidar & Kaviani, 2016). According to Vivienne (2016), Telegram lets the users create groups of up to 5000 members which is conducive to much interaction and collaboration for learning purposes. Moreover, each member can comment on the content posted by any other members through using the reply option available on the app which makes this app an appropriate platform for learning (Vivienne, 2016).

Telegram is used by a large online community (Ghobadi & Taki, 2018) and has been under investigation in language learning contexts since its inception. For instance, Ghobadi and Taki (2018) sought to investigate the impact of using Telegram stickers on EFL learners' vocabulary learning. The findings of their study revealed that using Telegram stickers had a positive effect on learning new vocabulary items among Iranian EFL learners. Similarly, Heidari Tabrizi and Onvani's (2017) results showed that learning vocabulary via Telegram was significantly more effective compared to conventional vocabulary learning. Likewise, Ghaemi and Seyed Golshan's (2017) findings indicated the positive effect of Telegram as a social network on learning English vocabulary among Iranian intermediate EFL learners. Moreover, some scholars (e.g., Brown, Castellano, Hughes, & Worth, 2012; Khaddage & Lattemann, 2013) have investigated learners' perceptions toward using such devices in L2 learning. The frequent emerging theme in these investigations is that learners hold positive attitudes toward learning language through apps.

As Steel (2012) notes, ubiquity, portability, convenience, and flexibility are the positive features of mobile applications that can facilitate teaching and learning. Zou and Li (2015) maintain that such applications provide the ability to customize student learning which is a big advantage over conventional teaching. As Skehan (2003) asserts, apps can create chances for learners to get involved in collaborative, interactive, meaningful, and challenging tasks that can affect language learning positively.The positive features of such applications offer the potential for focusing on the process of language learning in general and vocabulary learning in particular. Yet, we should not ignore the main principles of learning regarding the application of any vocabulary teaching and learning techniques. Out of a large number of these instructional techniques, some emphasize the process approaches that L2 learners can use to acquire their vocabulary knowledge.

As mentioned by Nation (2001), remembering a word involves the following three main processes: (a) noticing, (b) retrieval, and (c) creative or generative use. During the noticing stage, one should be consciously aware of the word to be learned. He/she needs to pay explicit attention to the new words. When it comes to the retrieval stage, the learner can remember the word along with its meaning. Finally, in the generative stage, the learner needs to be able to make use of various generative strategies such as mnemonic strategies and visualizations (Nation, 2001 as cited in Wu, 2011). In addition to the above-mentioned points, regardless of the techniques employed by teachers, the present level of students' vocabulary knowledge as well as their affective states including motivation, anxiety, styles and so on must be taken into account and correct feedback should be given, accordingly. This is consistent with Vygotsky's concept of Zone of Proximal Development (ZPD) and scaffolding.

According to Vygotsky (1978), the theory of ZPD refers to the gap between the present level of development indicated by the person's independent problem solving and the level of potential development indicated by problem-solving through relying on the support provided by the supervisor or in cooperation with a more capable friend or peer. In other words, the ZPD has to do with a group of functions and capabilities which have not been completely activated, as they are in the process of maturation. In fact, these potential functions will turn into fully active functions in the future (Vygotsky, 1978). Some kind of mediational strategy should be applied to fill the gap between the present status of knowledge and the target status of knowledge. This mediation can come in various forms including the interaction between more knowledgeable people and the learner (conventionally known as scaffolding in Vygotskian terminologies). Scaffolding has currently been the focus of many studies (e.g., Ahmadi Safa, &Rozati, 2016; AmiriSamani, &Khazayie, 2017; Harraqi, 2017; KhajehKhosravi, 2017; Zheng, 2016).

ZPD, which can be characterized as the zone of uncertainty and confusion, may be reduced by the student's ability to independently solve the problem. However, this process can be facilitated by the support of a more knowledgeable individual (Zheng, 2016). Such kind of support provided by a more knowledgeable person is called scaffolding. Vygotskydid not use the word "scaffolding".This word was coined and used by Wood, Bruner, and Ross (1976) to make the ZPD concept operationalizeable (Zheng, 2016). Thus, scaffolding refers to the purposeful intervention of a knowledgeable individual such as a teacher, aimed at helping the learner to make a smooth transition between the present status of knowledge and target knowledge (Zheng, 2016).

De Guerrero and Villamil (2000) describe scaffolding as a kind of supportive behavior whereby one partner in a semiotically mediated interactive context can help another individual to achieve higher levels of competence and regulation. Besides, individual differences between language learners are incorporated for purposes of giving a more accurate picture of scaffolding and vocabulary learning. Dörnyei (2005) has characterized learning strategies and self-regulation as some aspects of individual differences.

As a useful process, self-regulation-based learning helps students to take control and manage their thinking processes, emotions, feelings, and behaviors, enabling them to successfully go through their learning experiences. In the view of Zumbrunn, Tadlock, and Roberts (2011), self-regulated learning is achieved when a learner's purposeful actions and processes target acquiring information or skills.Carver and Scheier (1990) maintain that the self-regulation system has to do with multiple functions related to several fields of psychological research, such as studies on cognition, problem-solving, decision making, conceptual change, motivation, metacognition, and volition.

A review of the previous studies on vocabulary (e.g., Agustín-Llach, 2015; Alipour, Madarsara, Youhanaee, & Barati, 2015; Arast, & Gorjian, 2016; Ertürk, 2016; Ghanbari, & Marzban, 2014), social media apps (e.g., Brown, Castellano, Hughes, & Worth, 2012; Ghaemi &Seyed Golshan, 2017; Khaddage & Lattemann, 2013; Ghobadi & Taki, 2018; Heidari Tabrizi & Onvani's, 2017; Steel, 2012; Zou & Li, 2015) and scaffolding (e.g., Ahmadi Safa, & Rozati, 2016; AmiriSamani, & Khazayie, 2017; Harraqi, 2017; KhajehKhosravi, 2017; Zheng, 2016) reveals that, to date, no study, to the researchers' best knowledge, has investigated the effects of peer/ teacher technology-enhanced scaffolding through the process approach on Iranian high/low self-regulated EFL learners' vocabulary knowledge. Thus, the current study, in an attempt to fill the gap in the literature, sought to explore any significant interaction between self-regulation and peer and teacher scaffolding through the process approach in a technology-enhanced environment on vocabulary learning. Moreover, the study aimed to probe into any significant difference between peer and teacher scaffolding through the process approach in a technology-enhanced environment on vocabulary learning.

Research Questions

In line with the objectives of the study, the following research questions were formulated:

RQ1: Does peer scaffolding through the process approach in a technology-enhanced environment significantly affect vocabulary learning?

RQ2: Does teacher scaffolding through the process approach in a technology-enhanced environment significantly affect vocabulary learning?

RQ3: Is there a statistically significant difference between peer and teacher scaffolding through the process approach in a technology-enhanced environment on vocabulary learning?

RQ4: Is there a statistically significant difference between peer and teacher scaffolding through the process approach in a technology-enhanced environment on vocabulary learning?

Method

Participants

Initially, a total number of 170 male and female intermediate learners in university (Chalous Branch, Islamic Azad University) were selected based on convenience non-random sampling to participate in the current study. These initial 170 participants were given Oxford Placement Test (OPT) and the results were used to choose a homogenized sample of participants in terms of overall language proficiency. To this aim, only those learners who scored within the range of 28-36 in line with the instructions of the OPT manual were selected as the main participants of the study. It is noteworthy to mention that the researcher sought the participants' consent to take part in the study before the administration of treatment. Moreover, the treatment sessions were held exclusively for the current study. In other words, the treatment sessions were not part of the regular classes run at the university in which the study was conducted. It should also be noted that 134 learners obtained scores within the range of 28 to 36. However, 14 learners left the study during treatment sessions. Thus, there were finally three groups of 40 participants who remained in their groups up to the end of the study. There were three groups: peer scaffolding, teacher scaffolding, and control group each consisting of 40 learners. The participants were put into the three groups non-randomly as it was not possible to divide the learners into the three groups randomly. However, the assignment of the three groups of the study to peer scaffolding, teacher scaffolding, and the control group was random. The participants were all native speakers of Persian who participated in general English classes at the University. Their age approximately ranged from 18 to 30.

Materials and Instruments

To address the objectives of the present study, the following materials and instruments were used:

List of Words for Instruction. In order to teach the target words based on peer/teacher scaffolding through the process approach, a list of target words was prepared. This list was prepared based on students' responses to the items of a vocabulary test developed by Cambridge University Press (2005)(See Appendix A for a sample of items). To do so, the item facility index was calculated and items that were wrongly responded by ninety percent or more of the participants were chosen for instruction(See Appendix B for the IF indices for 30 sample items). Via this procedure, 137 vocabulary items were selected out of the initial 208 items. This test was the original test and given to the participants to select the items for the pretest and posttest of vocabulary. To control for test wiseness arising from the practice effect of taking the test, the researcher used two parallel versions for the pretest and posttest of vocabulary. To do so, the researcher changed the order of the test items and choices as well as the test stems.

Oxford Placement Test (OPT). At the beginning of the study, OPT was administered in order to ensure the participants' homogeneity in terms of English language proficiency. Oxford Placement Test (OPT) (Edwards, 2009), as a proficiency test, contains 60 items which test the English learners' language proficiency level. The participants' performance wasmeasured through their scores which showed their level of language proficiency from beginners to high advanced as follows: 1-17 (Beginner), 18-27 (Elementary), 28-36 (Intermediate), 37-47 (Upper-intermediate), 48-55 (Advanced) 56-60 (high advanced).

Vocabulary Pretest and Posttest. In order to measure vocabulary knowledge of the participants, a vocabulary placement test developed by Cambridge University Press (2005) was utilized both before and after treatment. The test contained 208 items determining the vocabulary

knowledge of the participants from elementary to advanced levels. Respondents needed to respond to all the items and they just continued to the extent they could and knew the words. In order to use a reliable test in the study, it was first piloted on a number of 30 participants with similar characteristics to those of the actual participants. Then Cronbach's alpha was employed to estimate the internal consistency of vocabulary test as an index of reliability. As for content validity, the content of the test was in line with the instructional content since the researchers used *EnglishVocabulary in Use* book series based on which the test items had been developed by Cambridge University Press (2005). Moreover, the content of the test was also checked by two Ph.D. holders in the field of TEFL in an attempt to make some revisions on the items. However, they both confirmed that the test had an acceptable level of content validity and thus no changes were made to the test stems and their respective responses. Since the posttest was a parallel version of the pretest, the researchers changed the ordering of the item responses to minimize the practice effect.

Self-Regulation Questionnaire. In order to determine the self-regulation level of the participants, a self-regulation questionnaire developed by Bufard, Vezeau, and Larouche, (1995) was used. The questionnaire contains 14 questions employing a 5-point Likert scale ranging from strongly agree to strongly disagree. It should be noted that items 5, 13, and 14 are scored reversely. It means that strongly disagree is an indication of better self-regulation instead of strongly agree in items 5, 13, 14. The test was translated to Farsi and validated by Kadivar (1999). Kadivar (1999) reported a reliability index of 0.71. In the current study, the questionnaire was piloted on a sample of 30 language learners to estimate the reliability and validity of the questionnaire before being used in the main study. The reliability index turned out to be .75 which is considered satisfactory. To assure that the test items had an acceptable level of face validity, the researchers appealed to expert opinion. To this end, the questionnaire was shown to two Ph.D. holders in the field of

TEFL and they both agreed that all the items measured the construct of self-regulation. To check the construct validity of the questionnaire, Exploratory Factor Analysis was used. The component analysis revealed the presence of 3 components with eigenvalues exceeding 1, explaining 26.48%, 24.278%, and 18.122% of the variance respectively (Table 1).

Table 1.

Factor Analysis Results for the Questionnaire

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%	Total
1	7.946	26.487	26.487	7.946	26.487	26.487	5.557
2	2.701	9.002	35.489	2.701	24.278	35.489	2.509
3	2.298	7.659	43.148	2.298	18.122	43.148	2.779
4	1.763	5.878	49.026				
5	1.584	5.278	54.304				
6	1.425	4.751	59.055				
7	1.183	3.943	62.997				
8	1.011	3.370	66.367				
9	.941	3.135	69.502				
10	.854	2.847	72.349				
11	.812	2.707	75.056				
12	.766	2.553	77.609				
13	.723	2.411	80.020				
14	.686	2.287	82.308				
15	.654	2.180	84.488				
16	.542	1.808	86.296				
17	.498	1.659	87.955				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Figure 1 displays the Eigenvalue scree plot for the components identified.
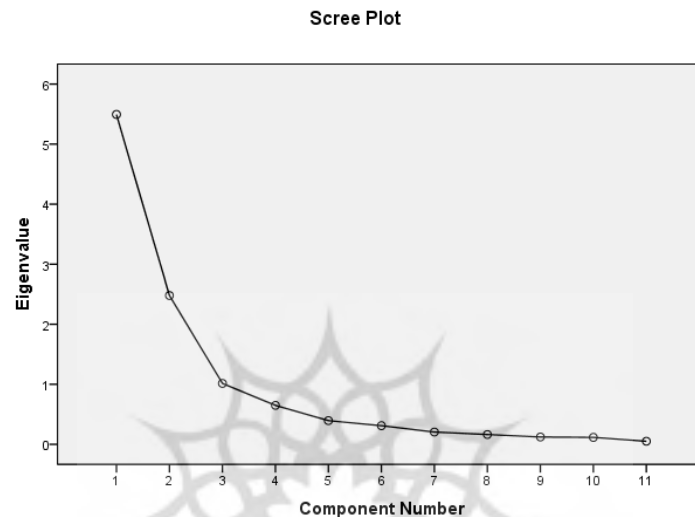
Figure 1. The Eigenvalue Scree Plot for the Components Identified

As shown in Figure 1, there are three break points in the slope which indicate the three components of the questionnaire.

Design

The present study involved three groups with two subgroups in each consisting of high and low self-regulated learners. Moreover, the treatment had two modalities including peer and teacher scaffolding. Accordingly, a 3 by 2 (3*2) factorial design was used in the current study.

Procedure

Initially, 170 participants chosen based on convenience sampling were given a sample copy of OPT. The researcher talked to learners from different classes and won the consent of 170 individuals to take the OPT. The researcher explained to the learners that based on the results those who are selected would

participate in a study. Following that, based on the results, 134 learners scored within the range of 28-36. However, only 120 remained in the study up to the last session. Thus, finally there were three groups of 40. Next, a vocabulary pretest and self-regulation questionnaire were administered to the three groups; peer scaffolding group, teacher scaffolding group and the control group. Students' scores in self-regulation questionnaires were also computed and those students with scores above the mean were identified as high self-regulated students and those with scores below the mean were regarded as low self-regulated learners. Therefore, there were three groups (peer and teacher scaffolding groups and the control group) within which there were high and low self-regulated students.

In the next stage, treatment started via Telegram in line with the tenets of the process approach as stipulated by Nation (2001) including noticing, retrieval, and generation. The administration of treatment in both peer and teacher scaffolding groups was based on Nation's three stages. The only difference between the two groups was that the provision of scaffolding in the peer scaffolding group was done by peers and for the teacher scaffolding group, it was done by the teacher. According to Nation (2001), in the noticing stage, which represents the initial stage of the process, the learner should be consciously made aware of the word to be learned. In the present study, this awareness was provided to the learners via bold-facing the target vocabulary items in the sentences containing the words posted on Telegram. As Nation (2001) maintains, the second stage is the retrieval stage in which the learner is highly likely to remember the word along with its meaning. In the current study, the retrieval stage was operationalized via the sentences with the target words missing posted on Telegram. The scaffolder had access to the Internet and was able to find sample sentences containing the target words. The learner-scaffolders were instructed to leave out the target words and post the sentences via the Telegram app. The scaffolder was also able to find pictures that represented the target words or held clues to the target words and post

them on Telegram to help with the retrieval stage. The third stage was the generative stage in which the learner should employ various generative strategies such as mnemonic strategies and visualizations to consolidate the target words and use them productively. In this study, the generative stage was practiced by instructing the learners to provide their partner with a target vocabulary item and asking the partner to either send over a sentence in which the word has been used, or a picture which represents the word under instruction via Telegram.

The participants in the peer scaffolding group were instructed on how to perform peer scaffolding on Telegram. To do so, the teacher trained learners on how to provide scaffolding on three sample target words for the whole class using Telegram and one of the learners as a peer. The teacher emphasized that the procedure used was only an example and the learners did not have to follow it strictly. The participants were told that the important goal was helping their peers to learn the intended vocabulary items. Then, the teacher created a group on Telegram and added all the learners to the group; however, only the selected learner interacted with the teacher. Then, the teacher initially found one sample sentence for each of the three target words and boldfaced the words under instruction. Next, the teacher copied and pasted the sample sentences onto the group. The learner was given one minute to read the sentences. Then, the teacher asked the learner to guess the meaning of the boldfaced items. If the guess was incorrect, the teacher would provide the learner with synonyms or a definition. The teacher also provided the learner with more example sentences until the learner was able to come up with the correct meaning of the word. As for the second stage, the teacher copied and pasted three other sample sentences with the target words missing and asked the selected learner to fill in the blanks with one of the words under instruction. After that, the teacher found a couple of pictures representing the words and asked the learner to say the word which was closely associated with the picture. Finally, the teacher asked the learner to make a sentence with each

word. The teacher also asked the learner to see if s/he can find other pictures on the net apart from the pictures she had already found which represented the words. Then learners in this group were paired up and each student in pairs received half of the target words (7 words) for each session. While at home, each pair was required to work on the target vocabulary items and help the peer to learn the intended vocabulary items. The following screenshots (Figure 2) show the initial stage of the treatment as carried out by a pair.
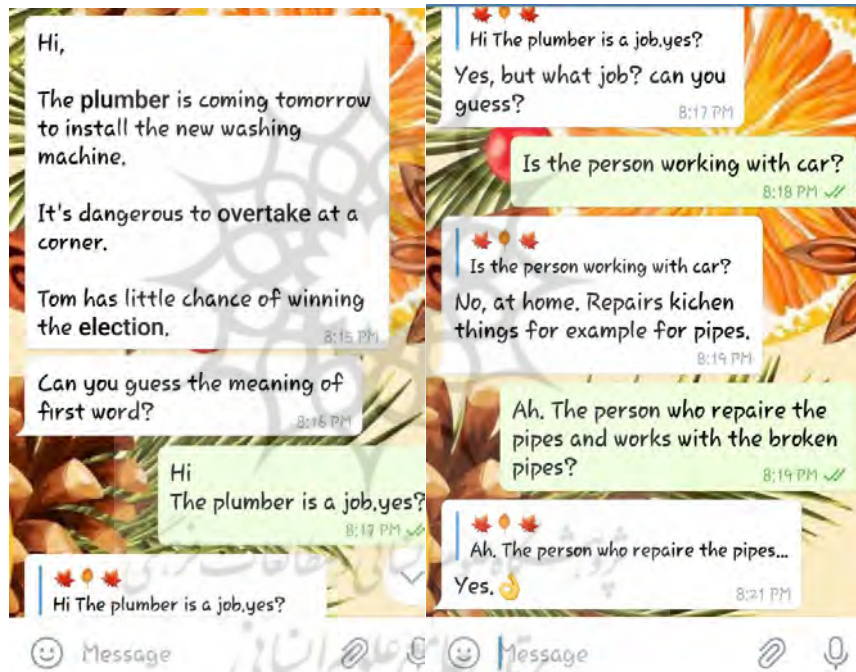

Figure 2. Screenshots of the Initial Stage of Treatment

Each pair was also required to add the teacher as the third member to the pair chat groups. This was done to make sure that the learners practiced all the words. The teacher frequently checked their pages just to make sure that learners were practicing the words. However, no feedback was provided by the teacher.

As for the teacher scaffolding group, the same procedure was utilized with minor changes. In this group, all the vocabulary items and the respective scaffolding was delivered by the teacher. To do so, the instructor created a group in Telegram and all students joined the group for receiving vocabulary instructions. As in peer scaffolding, the instructor went through the three stages of noticing, retrieval, and generation. The differences were that all the learners could participate in the process simultaneously and they sent the sentences for the generation stage to the instructor's private page. The teacher provided general comments for erroneous sentences and also followed up with more sample sentences and also definitions of the words for the learners who were in need of more assistance.

As for the control group, the traditional instruction of vocabulary items was carried out within the classroom environment. In this group, the same list of vocabulary items was explained by the instructor, and examples were also given. To be more specific, in this group, the learners were provided with example sentences and also exercises in *EnglishVocabulary in Use* book. Students' questions regarding the meaning of the words were also responded. The learners were also asked to make sentences with the new words but all this transpired without the use of the Telegram app. Moreover, no specific steps were followed for providing the participants with peer or teacher scaffolding via a process approach in the control group. The treatment lasted five weeks in 10 sessions lasting an hour and a half each. After finishing treatment, the researcher gave the groups a parallel version of the vocabulary pretest with a different ordering of items as posttest, and the results were used to explore the research questions.

Results

To address the first three research questions, it was initially required to make sure that the three main groups of the study were not significantly different in terms of vocabulary knowledge and self-regulation to control for

these two variables. To ensure that the three groups were not significantly different in terms of vocabulary knowledge, an ANOVA test was run on the vocabulary pretest scores of the three groups. Table 2 demonstrates descriptive statistics for the performance scores of individuals in the three groups on the vocabulary pretest.

Table 2.

Descriptive Statistics for the Performance Scores of Individuals in the Three Groups on Vocabulary Pretest

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Peer	40	92.6750	6.84026	1.08154	67.4874	71.8626	55.00	84.00
Teacher	40	91.2000	6.88067	1.08793	67.9995	72.4005	56.00	85.00
Control	40	93.6250	6.79626	1.07458	68.4515	72.7985	57.00	86.00
Total	120	92.500	6.79265	.62008	68.9388	71.3945	55.00	86.00

Table 3 shows the results of the one-way ANOVA test on the vocabulary pretest scores.

Table 3.

Results of One-way ANOVA Test for Comparing the Peer Scaffolding Group, Teacher Scaffolding Group and Control Group in Terms of Vocabulary Knowledge on Pretest

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.117	2	9.058	.194	.824
Within Groups	5472.550	117	46.774		
Total	5490.667	119			

As shown in Table 3, there is no significant difference among the three groups in terms of vocabulary knowledge at the outset of the study (F=0.19, p=0.82>0.05). Table 4 displays the results of the one-way ANOVA test on the self-regulation questionnaire scores.

Table 4.

Results of One-way ANOVA Test for Comparing the Peer Scaffolding Group,
Teacher Scaffolding Group and Control Group in Terms of Self-Regulation Scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	466.108	2	233.054	.87	.321
Within Groups	3371.883	117	28.820		
Total	3837.992	119			

As presented in Table 4, there is no significant difference among the three groups in terms of self-regulation scores (F=0.87, p=0.32>0.05). Accordingly, it was clear that there were no significant differences among the three groups of the study in terms of vocabulary knowledge and self-regulation. Therefore, any differences between the three groups on the posttest could be associated with the effects of peer and teacher scaffolding via a technologically-enhanced environment. Table 5 shows the descriptive statistics for the performance scores of individuals in the three groups on vocabulary posttest.

Table 5.

Descriptive Statistics for the Performance Scores of Individuals in the Three
Groups on Vocabulary Posttest

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
Peer	40	104.602	8.11709	1.28342	102.0040	107.1960	87.00	122.00
Teacher	40	104.102	7.93499	1.25463	101.5623	106.6377	88.00	120.00
Control	40	97.7500	7.84056	1.23970	95.2425	100.2575	82.00	114.00
Total	120	102.152	8.49582	.77556	100.6143	103.6857	82.00	122.00

Based on descriptive statistics, the peer scaffolding group scored 104.60 (SD=8.11), the teacher scaffolding group scored 104.10 (SD=7.93), and the control group scored 97.75 (SD=7.84) on vocabulary posttest. Table 6 shows

the results of one-way ANOVA among the three groups in terms of vocabulary posttest scores.

Table 6.

Results of One-way ANOVA between the Groups in Terms of Vocabulary Posttest Scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1166.600	2	583.300	9.194	.000
Within Groups	7422.700	117	63.442		
Total	8589.300	119			

According to the output of the one-way ANOVA test, a significant difference existed among the groups (F=9.19, p=0.00). This means that at least two of the groups were significantly different in terms of posttest vocabulary scores. To discover the existing differences, the Post Hoc test of Tukey was conducted. Table 7 shows the results of Post Hoc test of Tukey.

Table 7.

Results of Post Hoc Test of Tukey

(I) Treatment Group	(J) Treatment Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Peer	Teacher	.50000	1.78104	.958	-3.7280	4.7280
	Control	6.85000*	1.78104	.001	2.6220	11.0780
Teacher	Peer	-.50000	1.78104	.958	-4.7280	3.7280
	Control	6.35000*	1.78104	.002	2.1220	10.5780
Control	Peer	-6.85000*	1.78104	.001	-11.0780	-2.6220
	Teacher	-6.35000*	1.78104	.002	-10.5780	-2.1220
*. The mean difference is significant at the 0.05 level.						

The Post Hoc test of Tukey indicated that the control group was significantly different from both the peer scaffolding group and teacher

scaffolding group (p<0.05). Therefore, it can be concluded that peer scaffolding through the process approach in a technology-enhanced environment significantly affects vocabulary learning. Likewise, teacher scaffolding through the process approach in a technology-enhanced environment significantly affects vocabulary learning. However, there was no significant difference between teacher scaffolding and peer scaffolding groups (p>0.05). Therefore, it can be inferred that both teacher and peer scaffolding via a technology-enhanced environment positivity impacted vocabulary learning regardless of self-regulation. Moreover, there was not any significant difference between peer and teacher scaffolding in a technology-enhanced environment on vocabulary learning.

The fourth research question of the current study sought to discover any significant interaction between self-regulation and peer and teacher scaffolding through the process approach in a technology-enhanced environment on vocabulary learning. The answer to this research question was provided through employing a two-way ANOVA. Table 8 presents the results of Levene's test of homogeneity of variances.

Table 8.

Results of Levene's Test of Equality of Error Variances

F	df1	df2	Sig.
.305	5	114	.910

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Self-regulation + Treatment + Self-regulation * Treatment

According to Levene's test of equality of variances, variances were equal across the groups since the significant value equals .910> 0.05, which exceeds 0.05 alpha value. Hence, the use of two-way ANOVA on posttest scores was legitimate. Table 9 shows the interaction between self-regulation and peer/teacher scaffolding.

Table 9.

Results of Two-way ANOVA Reported for the Interaction of Self-Regulation and Peer/Teacher Scaffolding

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	812.174a	5	162.321	2.446	.143
Intercept	1378421.326	1	1378421.326	3.221E4	.002
Treatment Group	7.432	2	4.827	.631	.128
Self-Regulation	689.132	1	687.121	11.325	.261
Treatment Group * Self-Regulation	46.371	2	23.198	.391	.031
Error	7135.441	112	59.041		
Total	1319325.000	120			
Corrected Total	7914.431	119			
a. R Squared = .094 (Adjusted R Squared = .055)					

Based on the two-way ANOVA output, it was revealed that the main effect of treatment on vocabulary learning was significant (F=0.39, p=0.031<0.05), however, there was no statistically significant difference between the effects of the two treatment modalities on students' vocabulary learning (F=0.63, p=0.128<0.05).

Discussion

The present study aimed at investigating the effect of peer and teacher scaffolding through the process approach in a technology-enhanced environment on vocabulary learning among high and low self-regulated learners. The results of a one-way ANOVA revealed that both peer and teacher scaffolding significantly affected vocabulary learning. However, there was no significant difference between peer and teacher scaffolding in terms of their effects on vocabulary learning. The results of a two-way ANOVA indicated that the main effect of treatment on vocabulary learning was significant;

however, there was no statistically significant difference between the effects of the two treatment modalities on students' vocabulary learning.

The findings of the present study corroborate the findings of other investigations concerning the positive effect of using the Telegram app on vocabulary learning. For instance, the findings of the current study are in congruence with the results of Ghobadi and Taki's (2018) research. They found that using Telegram stickers had a positive effect on EFL learners' vocabulary learning. Likewise, the results of the current study are in accord with the findings of a study by Hidari Tabrizi and Onvani (2017). The results of their investigation revealed that learning vocabulary via Telegram was significantly more effective compared to conventional vocabulary learning. Additionally, the results of the present study are confirmed by the findings of a study carried out by Haemi and Seyed Golshan (2017). Their findings demonstrated that Telegram had a positive and significant effect on learning English vocabulary.

The findings of the present study can be explained because learners find the use of technology in general and apps in particular for language learning more interesting and effective compared to conventional methods of teaching (Khaddage & Lattemann, 2013). Moreover, the accessibility and user-friendliness of Telegram as an app that can be installed on different devices could be another reason for its contribution to vocabulary learning. Another justification for the results of the current study could be the motivational aspect of using technology for language learning. As Stockwell (2013, p. 157) notes "introducing new technologies into language learning environments has the potential to boost learner motivation". Additionally, Zhang, Song, and Burston (2011) maintain that apps can improve learners' efficiency and autonomy.

Conclusion

The results of the study indicated that both peer and self-scaffolding significantly improved the language learners' vocabulary. Both peer and self-scaffolding can be claimed to have one common core component that might account for why both have been successful in improving the L2 learners' vocabulary knowledge. Scaffolding is the common core, derived from Vygotsky's concept of ZPD. The learners with low ability and knowledge can decrease the ramifications of ZPD (the zone of uncertainty and confusion) by engaging in independent problem solving, which can be facilitated by resorting to the help of a more knowledgeable individual (Zheng, 2016). Such kind of support is described as scaffolding. Thus, scaffolding has to do with the purposeful support of a knowledgeable person such as teachers or peers. This support is aimed at helping the learner to bridge the gap between the present status of knowledge and target knowledge (Zheng, 2016). Vygotsky (1978) characterizes ZPD as the distance between one's current developmental level measured by independent problem solving and the amount of potential development measured by problem-solving through receiving help from a more knowledgeable or able adult (an expert), or by entering a collaborative relationship with more capable peers.

One more description can be given through a consideration of the role of process approach as well as the application of technology in improving L2 learning. The findings showed that the impact of peer and teacher scaffolding was the same in low and high self-regulated learners. However, it was expected that self-regulation could influence the impact of peer and teacher scaffolding which was not the case in the current study. The explanation can be that although true scaffolding is derived from a pedagogical theory, we should bear in mind that the impact of scaffolding is likely to have been reinforced by a systematic presentation of vocabulary in a technologically-enhanced environment. All these might make contributions to the overriding impact of scaffolding, diminishing the impact of individual differences such

as self-regulation. Nation (as cited in Wu, 2011) emphasizes the processes of vocabulary acquisition, namely, noticing, retrieval, and creative or generative use. These processes of vocabulary acquisition were used in the present study. For example, in noticing stage, L2 learners paid explicit attention to the new words. They tried to remember the words in the retrieval stage and in the generative stage they applied generative strategies such as mnemonic strategies and visualizations. Regarding the impact of technology, some investigations (e.g. Garrett, 2009; O 'Dowd, 2007; Warschauer & Meskill, 2000; Wiebe & Kabata, 2010, Toscu, 2013) have studied the effect of the application of technology on the quality of L2 learning and teaching, with many of them indicating positive outcomes.

Based on the findings of the present study, teachers are encouraged to employ scaffolding in a technology-enhanced environment for teaching vocabulary as an effective alternative to traditional instruction. Moreover, teacher educators are encouraged to help teachers gain more awareness regarding the positive effect of using scaffolding in a technology-enhanced environment when it comes to teaching vocabulary. All the educational institutions including language schools follow their administrators' policy. Accordingly, administrators and policymakers should develop positive attitudes toward more innovative approaches to vocabulary instruction such as process approach of vocabulary instruction via technology-enhanced environments.

Like many other studies, the present study had some limitations which can be addressed in future studies: First of all, the researchers had access to participants who were at the intermediate level of language proficiency. Researchers are encouraged to replicate the same study with participants from other proficiency levels. Moreover, the participants of the study were within the age range of 18 to 30. Replication of the same study with other age groups can provide a more comprehensive picture regarding the effect of peer and teacher scaffolding via a technologically-enhanced environment on

vocabulary learning. The researchers used Telegram as a social media app in the present study. Other studies can be carried out with apps other than Telegram. Other studies can be done to explore the impact of peer and teacher scaffolding via Telegram on other language components for instance grammar or colocations.

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Appendix (A)
An Excerpt of the Vocabulary Test

1) Fill the gap with the correct word. 'Don't eat too many cream cakes – they are very................................

A fattening B spicy C chilled D healthy

2) Complete the sentence with the correct word. When you want to drive past a car in front of you, you should wait until it is safe to ....

A park B pull out C brake D overtake

3) Which of these jobs is not a skilled manual job?

A plumber   B pilot   C electrician   D mechanic

4) Which of the following verbs is the odd one out?

A hit B throw C kick D whistle

5) Fill the gap with the correct word. Where is the film ....?

A take place B happening C about D set

6) Which word means the same as 'the latest'.

A the last B the best C the oldest D the newest

7) Fill the gap with the correct word. 'You can .... the file from the Internet.'

A collect B browse C download D save

8) Finish the sentence with the correct phrase. 'The police have arrested a man and………

A charged him with murder B investigated a crime C broken the law D proved he is guilty

9) Which phrase means the same as the underlined phrase. 'There is an election every four years.'A The election happens B We are electing the president C Elections are held D An election is made

10) Fill the gap with the correct word. 'The center of Rome is always .... with tourists at this time of year.'

A lively B cosmopolitan C busy D packe

Appendix (B)
Item Facility Indices for 30 items of the Vocabulary Test
Item Facility for the First 10 Sample Items on the Vocabulary Test

Participants	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10
1	0	1	0	1	0	0	0	0	0	0
2	0	0	0	0	0	1	0	0	0	1
3	1	0	0	0	0	0	0	0	1	0
4	0	0	0	0	1	0	0	1	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	1	0	0	0
7	1	0	1	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	1	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	0
11	0	0	0	0	1	0	0	0	0	0
12	0	1	0	0	0	1	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	1	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	1	0	0	1
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	1	0	0
18	0	0	1	0	0	0	0	0	0	0
19	0	0	0	1	0	0	0	0	0	0
20	0	0	0	0	0	1	0	0	0	1
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	1	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0

Participants	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10
26	0	0	1	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	1	0	0
IF %	10%	7%	10%	10%	7%	10%	7%	10%	7%	10%

Item Facility for the Second 10 Sample Items on the Vocabulary Test

Participants	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20
1	1	0	0	0	0	0	1	0	1	0
2	0	0	1	1	1	0	0	0	1	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	1	0	0	0	0	0
7	0	1	0	0	0	0	0	0	0	0
8	0	0	0	1	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	1	0	0	0	1	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	1	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	1
17	0	0	0	0	0	0	0	0	0	0
18	1	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0

Participants	Item 11	Item 12	Item 13	Item 14	Item 15	Item 16	Item 17	Item 18	Item 19	Item 20
20	0	1	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	1	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	1
26	0	0	0	0	0	0	0	0	0	1
27	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0
IF %	7%	10%	7%	10%	7%	0%	7%	0%	7%	10%

Item Facility for the Third 10 Sample Items On the Vocabulary Test

Participants	Item 21	Item 22	Item 23	Item 24	Item 25	Item 26	Item 27	Item 28	Item 29	Item 30
1	0	1	0	0	0	1	1	0	0	0
2	0	0	0	0	1	0	0	1	0	1
3	0	0	0	0	0	0	0	0	0	0
4	1	0	0	0	0	0	0	0	0	0
5	0	0	0	0	1	0	0	0	0	0
6	0	0	1	0	0	0	0	0	0	0
7	0	0	0	0	0	1	0	1	0	0
8	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	1	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	1	0	1	0	0	1	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0

Participants	Item 21	Item 22	Item 23	Item 24	Item 25	Item 26	Item 27	Item 28	Item 29	Item 30
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	1	0	0	0	0
17	1	0	0	0	1	0	0	0	0	0
18	0	0	0	0	0	0	1	0	0	0
19	0	0	0	0	0	0	0	1	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	1
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	1	1
28	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	1	0
30	0	0	0	0	0	0	0	0	0	0
IF	10%	4%	7%	0%	10%	14%	10%	10%	7%	10%