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Investigating the Effect of Serious Games as an Intervention on Iranian EFL Learners' Vocabulary Learning and Retention during COVID-19 Pandemic

Masoumeh Hosseinpour Emam[1] and Vizayaletchumi Pauline Roslin*[2]

[1,2] Faculty of Persian Literature and Foreign Languages, Islamic Azad University, Roudehen, Iran

***Corresponding Author:**

vprosline@yahoo.com

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ABSTRACT

The present study used a type of digital game-based language learning (DGBLL) application, called serious games (SGs), to seek its effect on vocabulary learning and retention. To this aim, young EFL learners from a language institute were assigned to a Control Group (n=26) and an Experimental Group (n=28). They were taught 40 words within 8 sessions of vocabulary instruction classes. In each class, both groups were taught the target words of the day as per the conventional mode of teaching, for the first 20 minutes. However, for the next 40 minutes, the Experimental Group was instructed to use the Fun Easy Learn application, which contained the words taught in class, while the Control Group continued with their regular mode of vocabulary instruction. To measure vocabulary learning and retention, vocabulary pretest, posttest and delayed posttest, comprising the target words, were administered to both groups before, immediately and six weeks after the intervention program, respectively. The results of data analysis using repeated measures ANOVA, comparing within-subjects and between-subjects' effects, showed that in comparison to the control group, the increase in the scores of the experimental group participants over time was statistically significant in their learning and, to a greater extent, their retention of vocabulary. Also, the data collected from interviews to gain learner perception of the intervention program showed that overall, the study participants were more motivated to use the application during online classes than during in- person learning. Elicited responses also revealed that teacher- centered online instruction, frustration due to lack of social communication with their classmates, and the ineffectiveness of the internet system were contributing to their increasing lack of interest in learning. Thus, this study provides empirical evidence of the potential effectiveness of serious games used as interventions during online vocabulary instruction to reinforce learning and retention. The qualitative data suggests that SGs could help maintain learner motivation especially when learners become disengaged with online teacher centered instructions, and when learning environments and conditions are not conducive to learning such as those that are prevalent these days due to the COVID-19 pandemic.

Keywords: Serious Games, Vocabulary Learning, Vocabulary Retention

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Introduction

The important role that vocabulary plays in successful language learning has been well recognized. Research has provided ample evidence to support this phenomenon. To illustrate, some studies have shown that comprehensible communication, which is why language is mainly used for, cannot transpire without the use of adequate vocabulary [1, 2]. Also, it is found to affect reading [3, 4] and writing abilities [5], reading comprehension and proficiency [6]. More importantly, vocabulary is believed to provide much of the basis for how learners speak, listen, read and write [7, 8, 9]. Going a step further, researchers such as Maximo [10, 11, 12, 13] state that the acquisition of vocabulary is essential to the formation of complete spoken and written texts. Thus, it can be reiterated here that vocabulary learning plays a vital role in the development of all language skills.

In the context of language teaching, both teachers and students agree that the acquisition of the vocabulary is a central factor [14]. Despite its importance, vocabulary learning is still a problem for language learners as seen in studies such as those conducted by Orawiwatnakul [8], Demir [9] and Çelik and Toptaş [15]. Even in the English as a Foreign Language (EFL) context, studies have found that English vocabulary knowledge and learning rates are considerably lower than what is considered to be a norm in first language contexts [15]. These researchers concluded that inter-related factors, besides insufficient input in classrooms, insufficient time dedicated to vocabulary learning as well as ineffective teaching methods and strategies have led to the insufficient growth in EFL learners' vocabulary knowledge. In Iran too, it is believed that the lack of vocabulary or word-learning strategies has been causing EFL learners to struggle throughout their educational careers [16].

When it comes to the best period for vocabulary learning, the Critical Period Hypothesis for language development [17] is particularly relevant here. It states that language is best learned during the early years of childhood. Overall, young learners are said to have a short attention span and thus a variety of activities are needed to encourage them to continue their learning activity. As for vocabulary, it is said to play a great role in young learners' language development [18, 19] as it can assist with young learners' critical literacy skills, such as letter–sound knowledge [20], decoding [21] and morphological awareness. In contrast, insufficient vocabulary knowledge is seen as a critical problem for many young English Language learners and that the level of success of young learners with low vocabulary development continued to decrease after a few years of learning [22].

In order to compensate for these drawbacks in vocabulary teaching and learning, many approaches have been introduced and studied. Among these approaches is the use of games that caters to teaching new words to young learners. Overall, related studies have found that games create an interesting and fun learning atmosphere [23, 24, 25, 26, 27], foster learning and class participation [23, 25, 28] capture learners' attention, help sustain learner motivation [28], stimulate students' critical thinking [29, 30], teach learners to evaluate, synthesize, analyze and organize information [31], introduce friendly competition [23], encourage cooperative group work and enhance group dynamics [31]. Moreover, it was found that games can help students make visual- auditory associations between pictures and pronunciation.

The pedagogical approach of using games in education is called game-based learning (GBL). According to Benson [32], GBL is education through learning resources. He adds that these resources are presented in the form of a game using standard strategically developed electronic games, as well as games that are specially designed for that sole purpose. With the introduction of 'Gamification', this methodology was renamed digital game-based learning (DGBL) [33]). According to Kapp [34], "Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems" (p. 10). The positive effects of digital game- based learning led to its introduction in language learning. Digital game- based language learning (DGBLL) is mainly divided into two main categories: commercial off-the-shelf (COTS) games, which are designed for entertainment but have educational value; and educational games, also called serious games (SGs) or edutainment, which are designed to educate, train and inform users. Applying this in vocabulary instruction, the former can be said to be simply; games that can be used to teach new words, while the latter; educational applications specially designed to teach new words by means of 'Gamification'.

The review of digital game- based language learning (DGBLL) show that studies conducted till date were mostly on commercial off-the-shelf (COTS) adventure games. Overall, studies on learning a foreign language through COTS games investigated the effects of player attributes, in-game and non-game variables and reported mainly positive results [35, 36]. In recent Iranian research too, the use of computer digital games is seen to possess potentialities of offering information in different modes, such as aural, video and visual; besides having positively influenced (grammatically) correct language use [37]. However, the studies focusing on serious games (SGs) just offered technical and instructional suggestions [38, 39] and examined mostly learners' opinions towards SGs. All the previous studies, except one, reported that students had positive attitudes towards SGs and that their motivation was a

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determining factor in their positive perceptions of the games [40, 41, 42].

Studies have also revealed that vocabulary is the most dominantly practiced language skill using Digital Game Based Language Learning (DGBLL) [43]. However, related research mostly focused on higher education learners. Even in the Iranian EFL context, though many studies on digital games revealed their positive effects on vocabulary acquisition, there is a lack of studies on the impact of serious games on vocabulary learning and retention and on vocabulary retention, on the whole. Furthermore, anecdotes from Iranian EFL learners have revealed that the COVID-19 pandemic was changing overall learner attitude and motivation to learning. However, research is needed to support these claims. Thus, the importance of vocabulary in language learning and problems within the novel Covid-19 learning environment show the need for a study on effective online tools to foster vocabulary learning and retention. Besides these factors, the proven effectiveness of DGBLL and related research gaps in vocabulary learning and serious games have led to this study. Consequently, this study sought the impact of FunEasy Learn, a type of digital game-based language learning (DGBLL) application called serious games (SGs) on vocabulary learning and retention in novel learning environments such as the one created by the COVID-19 pandemic using young Iranian EFL learners, as a case study.

Participants

The sample of this study consisted of young female EFL learners participating in regular EFL classes in a language institute situated in Tehran province. These were at first conducted as In-Person classes but COVID-19 related problems led their switch to the online mode. These learners, whose ages ranged from 8 to 12, were from several intact classes. In total, there were 54 student participants from which those from the Odd days' classes were assigned to the Control Group (n=26) and those from the Even days' classes were assigned to the Experimental Group (n=28).

Key Terms /Instrumentation

The key terms and related instruments/ teaching application used in the current study are as follows:

Vocabulary Learning

Vocabulary learning in language pedagogy and studies is often related to vocabulary knowledge or gaining access to and retrieving a known and understood word. To know a word, according to Nation (2001), is to know its form, meaning, and use. In this study, since the mode and material related to vocabulary teaching and learning are mostly on basic spoken and written forms of the target words, learning is considered as learners' ability to recognize the spoken and written form of these words presented in vocabulary tests.

According to Nation [44], the spoken form of a word is about what the word sounds like and how the word is pronounced; while the written form is about what the word looks like and how the word is written and spelled. Vocabulary learning was thus, measured by the analysis of the differences in the learners' scores between vocabulary pretest and posttest (administered before and immediately after the intervention /instruction, respectively) (p. 27).

Vocabulary Retention

Vocabulary retention has been defined as "the ability to recall or remember things after an interval of time. In language teaching, retention of what has been taught may depend on the quality of teaching, the interest of the learners, or the meaningfulness of the materials" [45]. In this study, vocabulary retention was measured by the analysis of the differences in the learners' scores from vocabulary posttest to delayed posttest. (Administered immediately and 6 weeks after the intervention /instruction, respectively).

Digital Game Based Language Learning Application (Serious Games)

The sample Serious Games application used in this study is the FunEasy Learn application for young learners (www.funeasylearn.com). This vocabulary application was chosen for this study as it is a type of 'serious game' which applies the principles of 'Gamification' as defined by Kapp [34] and is the focus of this study. It correlated with the format of the teaching material of this study. In other words, the games were about what each word sounds like and how it is pronounced as well as what each word looks like and how it is written and spelled. According to Nation [43] the former relate to the spoken form of a word while the latter, on its written form.

Vocabulary Tests (as the pretest and posttest and delayed posttest).

The test items in the study's vocabulary tests were presented in exactly the same format as the way the application and teaching material of this study were designed to teach their users new words. In other words, the vocabulary tests of this study tested only the spoken and written forms of the words. All 40 words taught in class and played in the application were the items tested in all three tests. Test items were in the form of 14 matching items (words with pictures/pictures to word), 13 multiple choices (listening to each word and choosing correct picture/word) and 13 fill in the blanks with missing letters (pictures provided). These test items, taken from the site of the application, were previously validated in

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terms of construction as they were designed by experts in education. Content validity was established by having three teachers of English. However, the reliability of the test was measured using Cronbach alpha formula. The turnout value of 0.733 showed acceptable index of reliability.

The time allocated for each set of questions was 30 minutes and each correct response carried 2 marks. So, the teacher-researcher had to administer the test in three sessions as the young learners refused to spend more than 30 minutes to attempt a test. The instructions to the tests were given by the teacher herself in Persian as these were conducted online using the same platform as the one used for EFL instruction by the institute. Pretest was administered before the intervention; this test was administered again as the posttest. After a span of six weeks, subsequent to the administration of the posttest, the students attempted a delayed posttest. In order to obtain a more reliable data, the sequence of items in the posttest was changed in the delayed posttest.

Results-Quantitative Data

Table 1
Repeated measures ANOVA -Tests of Within-Subjects Effects

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Tests	Sphericity Assumed	55358.772	2	27679.386	755.001	.000	.936
	Greenhouse-Geisser	55358.772	1.041	53194.391	755.001	.000	.936
	Huynh-Feldt	55358.772	1.064	52051.527	755.001	.000	.936
	Lower-bound	55358.772	1.000	55358.772	755.001	.000	.936
Tests * Group	Sphericity Assumed	779.019	2	389.509	10.625	.000	.170
	Greenhouse-Geisser	779.019	1.041	748.561	10.625	.002	.170
	Huynh-Feldt	779.019	1.064	732.478	10.625	.002	.170
	Lower-bound	779.019	1.000	779.019	10.625	.002	.170
Error (Tests)	Sphericity Assumed	3812.784	104	36.661			
	Greenhouse-Geisser	3812.784	54.116	70.456			
	Huynh-Feldt	3812.784	55.304	68.942			
	Lower-bound	3812.784	52.000	73.323			

Table 2
Repeated measures ANOVA - Multiple Comparisons: Changes Over Time

	(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.[c]	95% Confidence Interval for Difference[c]	
						Lower Bound	Upper Bound
Experimental	1	2	-35.467*	1.346	.000	-38.219	-32.714
		3	-35.067*	1.415	.000	-37.961	-32.173
	2	1	35.467*	1.346	.000	32.714	38.219
		3	.400	.278	.161	-.168	.968
	3	1	35.067*	1.415	.000	32.173	37.961
		2	-.400	.278	.161	-.968	.168
Control	1	2	-29.800*	1.384	.000	-32.631	-26.969
		3	-26.200*	1.326	.000	-28.913	-23.487
	2	1	29.800*	1.384	.000	26.969	32.631
		3	3.600*	.338	.000	2.909	4.291
	3	1	26.200*	1.326	.000	23.487	28.913
		2	-3.600*	.338	.000	-4.291	-2.909

Based on estimated marginal means
*. The mean difference is significant at the .05 level.

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Four types of repeated measures ANOVA tests were used to analyze the quantitative data. First, repeated measures ANOVA within subject effect test was used to see how significant the overall increase in each group's participants' scores were. Results in Table 1 show a significant difference in the vocabulary scores of participants in both groups from pretest to delayed posttest (F (2, 1.041) = 755.001, p = .000 <.01, eta squared = .936, representing a very large effect size). This means that the methods used to teach vocabulary in both groups were effective in significantly increasing the participants' overall vocabulary learning and retention.

Next, to seek the changes over time of each group, within- subject effect test was used. This test shows how significant the increases in both groups' participants' scores was from pretest to posttest as compared to those from posttest to delayed posttest. The results in Table 2 show a significant (MD = 35.47, SE = 1.35, p = .000 < .01) increase in the experimental group's scores from test 1 (pretest) to test 2 (posttest). Also, though there seems to be a decrease in the scores from test 2 (posttest) to test 3 (delayed posttest), this decrease is not significant (MD = .4, SE = .278, p = .161 > .05). On the other hand, the results also show that, though the increase in the scores from pretest to posttest of the control group is significant (MD = 29.8, SE = 1.38, p = .000 < .05), the decrease in the scores from the posttest to delayed posttest (MD = 3.6, SE = .34, p = .000 < .05) is also significant. This means that the experimental group significantly outperformed the control group in terms of vocabulary retention**.**

Table 3
Repeated measures ANOVA- Between-Subjects Effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	302416.022	1	302416.022	1424.858	.000	.961
Group	1027.222	1	1027.222	4.840	.032	.077
Error	12310.089	52	212.243			

To see if the changes in the experimental groups is due to the effect of the intervention and not the method used in both classes, a between-subject effects comparison was done. This test was also used to compare the effects of the two methods with each other. The main results of the test presented in Table 3 show that there is a significant difference between the two groups' change of vocabulary scores over time ($F_{(1,52)}$ = 4.84, p = .032 <.05, partial eta squared = .077, representing a medium effect size). Finally, in order to locate the differences, pairwise comparisons were run.

Table 4
Repeated measures ANOVA-Multiple Comparisons: Changes between Groups

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Experimental	Control	4.778*	2.172	.032	.431	9.125
Control	Experimental	-4.778*	2.172	.032	-9.125	-.431

The results of the multiple comparisons (Table 4) show that the experimental group has significantly (MD = 4.78, SE = 2.17, p = .032) outperformed the control group throughout the time. Based on the results obtained from the within-subjects and between-subjects effects tests, both the study's hypotheses below were rejected.

$H0_1$: The use of Fun Easy Learn application as an intervention during vocabulary instruction does not have any significant effect on Iranian EFL learners' Vocabulary Learning.

$H0_2$: The use of Fun Easy Learn application as an intervention during vocabulary instruction does not have any significant effect on Iranian EFL learners' Vocabulary Retention.

Results –Qualitative Data

The aim to collect qualitative data was decided about half-way through the study for several reasons. The first was that the Pretest for the study was collected prior to the switch from In-Person to Online classes. Also, since the study participants had already had 3-4 sessions of the intervention during In-Person classes prior to the switch to online classes, the opportunity to compare their experiences within these two contexts was seen. Thus, the study participants 'perception on the comparative effectiveness of using the study's application was deemed necessary and important, especially since the effect of the new learning environment caused by the pandemic has not been explored thoroughly.

Thus, subsequent to the intervention, 10 participants (2-3 from each of the Experimental Group classes) were interviewed immediately after the administration

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of the posttest to collect data related to the study's third research question, which was:

RQ3: Do Iranian EFL learners perceive to be more motivated to learn vocabulary while using Fun Easy Learn application during In-Person classes than during Online classes? If so, why?

Since the participants were young and were not expected to understand the construct of 'motivation', three simple questions with words they can understand and respond to easier, such as 'fun' and 'want to use…more' were framed to gain learner perception to RQ3.:

1. How much fun did you have while using FunEasy Learn application to learn new words during In-Person classes?
2. How much fun did you have while using FunEasy Learn application to learn new words during your online classes?
3. During which classes did you want to use FunEasy Learn application to learn new words more; In-Person classes or online classes? Why?

The results showed that most students (8/10) perceived an average level of fun with using FunEasy Learn application during In-Person classes while almost all the students (9/10) perceived using FunEasy Learn application during In-Person classes as being a lot of fun. Also, almost all the students (9/10), perceived that they wanted to use FunEasy Learn application to learn new words more during online classes than during In-Person classes. The elicited responses to the second part of this question revealed that overall the interface of the FunEasy Learn application has a good visual appeal especially since it was colorful with interesting pictures. Also, it offers practice in spelling, pronunciation and writing the words. The participants believed that all these factors helped them remember the learned words better.

However, they complained that during online classes, the internet connectivity was 'bad'. Also, they missed being and interacting with their friends directly. Also, online classes made them 'tired' and 'bored'. They also said that they preferred being 'physically' present in classes. Moreover, many confessed that they were not 'really' listening when the teacher was teaching and became 'interested' only when it was time to use the application. Playing games within the application, some stated, was a means to pass their time 'happily'

Overall, in response to research question three of this study, it was noted that EFL learners perceived that the application provided a pleasant diversion to the boredom they felt during online classes. Their frustration was compounded by lack of social communication and the ineffectiveness of the internet system in Iran.

Conclusion

The quantitative data of this study pointed to the relative effectiveness of FunEasy Learn application on young Iranian EFL learners' vocabulary learning and retention as compared to the conventional mode of vocabulary instruction. To be exact, though there were significant increases in vocabulary scores from pretest to posttest in both groups, the Experimental Group significantly outperformed the Control Group in terms of vocabulary learning and more so in vocabulary retention.

A detailed analysis of qualitative data obtained through interviews revealed that the participants perceived that the use of FunEasy Learn application was more motivating during their online vocabulary instruction classes than during their In-Person Classes. The interview sessions revealed that many interviewees felt using the application was a 'respite' from the boring online vocabulary instruction. Furthermore, since they claimed that they were 'happy playing the games' in the application as a kind of entertainment, this may point to the effect of incidental vocabulary learning through games. In others words, they could have indirectly learned the words while playing games. Incidental learning involves learning words as the by-product while the learner is engaged in a listening, reading, speaking or writing activities.

This qualitative data substantiates the findings of the quantitative data and thus this study concludes that game-based learning called serious games (SGs) could affect vocabulary learning and retention in novel learning environments such as the one caused by the COVID-19 pandemic. Learner perception in the interviews emphasized SGs role in reinforcing and maintaining learner motivation and progress especially when learners become disengaged in traditional instructions, and when learning environments and conditions are not conducive to learning.

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