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The Effect of ARLOOPA Augmented Reality App on Vocabulary Learning and Retention of High School Students

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Abstract

English language literacy is a complicated learning process that every English Language student should acquire to communicate efficiently and to take part successfully in jobs and economy. Accordingly, the aim of the present research was to find out the effect of ARLOOPA augmented reality app on the vocabulary learning and retention of high school students. For obtaining the objectives of the study, 30 Iranian EFL female elementary students studying English in Kar Danesh vocational school were selected according to intact group sampling. First of all, the vocabulary pretest was conducted before the treatment to find about the learner's initial vocabulary level. Then, while the experimental group practiced augmented reality-based instruction, the control class just practiced their routine way of instruction. After implementing 12 sessions of the treatment, a post-test same as the pre-test was carried out for the subjects to assess their vocabulary level as an effect of treatment. Furthermore, two weeks after the posttest, the participants retook the vocabulary test; these scores were recorded as their vocabulary retention scores. For examining the data, SPSS program was utilized to administer independent samples t-test to compare the test grades of both groups. The results of data analysis revealed a difference between the experimental and control classes mean scores, i.e. the experimental class performed better than the control class in vocabulary learning. Furthermore, the experimental class performed better than the control class in vocabulary retention. Though the mean score of experimental group was slightly higher in delayed-test than post-test.

Keywords: ARLOOPA app, augmented reality-based instruction, vocabulary skill

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1. Introduction

The use of instructive technology means has turned into a vital share of the acquisition procedure inside and outside of curriculums (Khodabandeh, 2022a). Nonstop growth of technology makes some changes in education and acquisition performs. Throughout this process, students' profile may modify, as well. As nowadays generation is named digital native, the appliance of internet in instruction creates acquisition more inspiring, encouraging, significant and noteworthy (Tiven et al., 2018).

Technology is getting developed so quickly nowadays. Technological progressions created together with acquisition sources makes an idea that the combination of technology for acquisition might create a modern age in the instruction. Augmented Reality (AR) can be considered as an encouraging technology which is being utilized in different dimension of instruction. AR might improve instruction by immersive and collaborative practices in fields extending from engineering and science up to social science and foreign languages (Liono et al., 2021).

Today, AR tools are more reasonable and extensively obtainable. The challenge has come to be the discovery of a method to use this technology in authentic acquisition usefully. This benefit can response to the problems in the instruction process because of the numerous special instructional requirements, like the absence of learner's consideration, focus, confidence as well as previous knowledge. Accordingly, AR is an encouraging solution. The key aim of AR might be recovering and improving perfection of backgrounds through relating visual, audio and physical understanding (Liono et al., 2021).

AR similarly expands many unfilled gaps in definite tasks that needs a great deal of immersion practice that might not be attained. Positive impacts were discovered while utilizing AR in instruction are improved acquisition conduction and inspiration, great amusement and participation, great encouraging viewpoints to the acquisition sources, and a good cooperation between students. Concerning to the above mentioned impacts, lots of researches have mentioned AR's efficiency in elementary, secondary and advanced teaching to rise learner inspiration, acquisition outcomes, cooperation, communications, acquisition viewpoints and amusement. This fact must provide a great chance to employ AR in improving the learner's vocabulary knowledge (Liono et al., 2021).

Today, instructing vocabulary is one of the most difficult activity in Iranian and non-Iranian setting (Javadi-Safa, 2018). As Siskova (2008) and Ilham (2009) put it, vocabulary is the main part in the foreign language and sustaining not enough quantity of vocabulary knowledge might have harmful influence on English language acquisition process. In EFL setting, students mainly complain about the tedious essence of vocabulary acquisition. Thus, much attention must be given to discover the best method for instructing this essential element skill in the classroom. To meet this requirement, instructors and investigators look for techniques and tasks to instruct this skill usefully. One of such tasks that has received consideration is the utilization of Augmented Reality in English classrooms. Nevertheless, before utilizing it as a useful acquisition means, sufficient evidence is needed that must be obtained according to research. Augmented Reality might be utilized as an influential means for instructing language overall and instructing vocabulary skill in particular.

As a matter of fact, in spite of the existence of many empirical evidence that shows the effectiveness of augmented-reality-enhanced learning on acquisition efficiency, motivation as well as attitude (Chen, Wang, Zou, Lin, Xie, & Tsai, 2020) the outline of an AR-based teaching scheme model to enhance vocabulary ability (Eang & Na-Songkhla, 2020); the impacts of gender and various augmented reality acquisition methods on English vocabulary acquisition Hsu, 2019); the impact of using AR in language classrooms on adapting textbooks for ELs (Hadid, Mannion, & Khoshnevisan, 2019), little is identified regarding the impact of augmented reality on vocabulary learning and retention of high school students. Therefore, the current research aimed to respond to this gap. Specifically, the present paper entailed to investigate the effect of ARLOOPA augmented reality app on vocabulary learning and retention of high school students. Presenting the gap stated above, this research tries to respond to the following research questions:

Q1: Does using ARLOOPA app and materials designed with augmented reality improve Iranian high school students ' vocabulary learning?

Q2: Does using ARLOOPA app and materials designed with augmented reality improve Iranian high school students ' vocabulary retention?

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Accordingly, to investigate the research questions empirically, the following null hypotheses were provided on the basis of the findings from previous studies:

H01: Using ARLOOPA augmented reality app does not improve Iranian high school students ' vocabulary learning.

H02: Using ARLOOPA app and materials designed with augmented reality does not improve Iranian high school students ' vocabulary retention.

2. Literature Review

There have been numerous researches in the area of the effects of augmented reality on learners ' vocabulary acquisition. For instance Tsai (2020) examined the alterations in learners' English vocabulary acquisition act and the teaching sources motivation, contrasting the conventional instructing way and the AR way. Totally, there were 42 learners in an elementary school who participated in this research. Data were gathered through English vocabulary exams, a teaching sources motivation questionnaire, as well as interviews. The results indicated that the teaching sources motivation and act of the learners instructed utilizing AR were far better than the learners taught utilizing the conventional instructing way. Moreover, outcomes of this research recognized the chances and problems while accepting AR and utilizing the conventional ways to acquire vocabulary. The mentioned results may present effective visions to the effective usage of English teaching in elementary school EFL learners and instructors.

Chen, Wang, Zou, Lin, Xie, and Tsai (2020) worked on the impacts of captions as well as English ability in augmented reality on acquisition efficiency, motivation and attitude. Augmented reality develops acquisition communications by placing digital data on upper of physical context. This research used an AR-improved acquisition and intended to test the impacts of captions and English proficiency on learners' English acquisition efficiency, motivation and attitude. The outcomes revealed that using captions did not impact information perception, however English ability has a substantial effect. The impacts of the treatment on knowledge usage showed that captions located high conceptual content and prevented less capable students' information usage, however proficient students done similarly under various caption settings. Totally, learners indicated positive motivation to acquisition from the AR-based acquisition. The capable students were becoming inspired regarding self-effectiveness, proactive acquisition and acquisition value. All students stated positive viewpoint to acquisition, among, students who acquired without captions indicated better amount of confidence and favorites, and the capable students indicated higher amount of confidence, preferences, acquisition procedure and acquiring plan however lower amounts of anxiety.

Eang, and Na-Songkhla, (2020) done a research on the outline of an AR-based teaching scheme model on the basis of the situated acquisition to improve learners' vocabulary ability. The researchers done this research to suggest a basis for an AR-based teaching scheme model according to the situated acquisition to improve learners' vocabulary ability. The suggested framework was assessed by specialists. The outcomes discovered that AR-based instruction scheme model includes 1) examination, 2) AR Expansion, 3) AR based Expansion, 4) Teaching Expansion, 5) Schema Application, and 6) Schema Alteration. The outcome proposed a greater grade than pretest, indicating a significant difference.

Hsu (2019) carried out a research on the impacts of gender beside to various augmented reality acquisition methods on elementary learners` vocabulary acquisition. This research established and made comparison between two augmented reality acquisition systems for learners to acquire vocabulary in a situated setting. The learners required to gather the reality objectives without getting limited to that they might begin from. The other scheme was established on the basis of a SMG design that presented the learners included seven steps to make in order. The impacts of gender besides scheme on the learners' information, cognitive capacity, and acquiring efficiency were evaluated. The outcomes showed that the learners utilizing the two schemes had likewise high acquisition efficiency. Nevertheless, those utilizing the CGB system indicated higher stream practice and inferior internal cognitive contents in contrast included learners utilizing the second scheme. The male learners had great stream practice in both schemes; nerveless, the stream practice of the females in the first design performed better than that of the females in the second system.

2.1 Vocabulary Knowledge

Acquiring a language needs acquisition of various abilities containing all English skills. It is substantially essential to distinguish that learning these abilities needs acquiring structure, words, and pronunciation (Cimermanová, 2018). A

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student might not be able to interact usefully without recognizing sufficient word. Word is necessary meant for listening and reading skills. Writing can be made by utilizing suitable words (Fasih, Izadpanah, & Shahnavaz, 2018). Effective word selection leads to great utilization of structure. Thus, significance of acquisition and recalling word can be an inevitable section of language acquisition. In the words of Dehjalali and Izadpanah (2017) indicating content without structure is somewhat probable but without word is not possible. Word has been realized as content transporter. There exists a shared interaction between word learning and interaction. The greater word knowledge a student obtains, the greater capable s/he would be in interaction and opposite (Alqahtani, 2015; Bouchaib, Ahmadou, & Abdelkader, 2018).

Vocabulary proficiency has a significant role in the achievement of students' acquisition. Students who can indicate substantial vocabulary growth inclined to have a smaller amount difficulty in utilizing the second language in spoken and written kind. Nguyen and Nation (2011) emphasized the significance of word in foreign language acquisition. With sufficient word data and growth, useful interaction, and relations among persons all over the world might happen. It shown that the presence and proficiency of vocabulary are dimension that everyone must obtain to usefully utilize a language. In foreign language acquisition context, like English in Iran, students' capability to acquire a language identifying words, understanding their contents, and suitably utilize the vocabularies in setting is predictable however difficult.

2.2 Augmented Reality Learning

Since AR includes picturing as well as communication, it has numerous capability for increasing EFL acquisition regarding related picturing (i.e., offering computer-generated data in meaningful backgrounds) and acquisition communication (i.e., representing communications with computer-generated concept). The previous works has showed that AR-centered acquisition can be reinforced by two notions, experimental acquisition and contiguity value of audiovisual aid acquisition (Teng et al., 2018).

Experimental acquisition reflects practices as the basis of acquisition and supports that acquisition occurs while learners make significant practices from situations, on the basis of that, Huang et al. (2016) created an AR-centered environmental scheme and discovered meaningful outcomes. The contiguity belief of hypermedia acquisition, that supports combining texts including equivalent visuals or items, has been extensively implied to EFL acquisition and supported as useful and trustworthy (Jiang, Renandya, & Zhang, 2017).

2.3 Possibilities of Augmented Reality in the Educational Context

The utilization of evolving AR technology presents promising benefits to the instructional area. Researchers investigating on probability of AR knowledge in instruction have showed that AR can be inseparably related with intellect (Huang & Liao, 2015; Küçük, Kapakin, & Göktaş, 2016) and communication (Di Serio, Ibáñez, & Kloos, 2013). AR permits learners to get connected with data well (Scholz & Smith, 2016). For example, some AR tools in teaching are from Matsutomo et al. (2012) utilizing AR to show computer-generated magnetic concepts on corporal magnets from Tarng and Ou (2012), utilizing AR to show a virtual butterfly on an actual plant.

In spite of being able to improve real-world items with digital data, AR might also be useful for learners regarding to recalling as acquisition contents are made to be related with digital concepts and a real setting (Fujimoto et al., 2012). Moreover, AR, has been indicated to be used in global acquisition authentically as it offerings digital data on real-world items which, then, makes an explicit connection with the real context (Joseph & Uther, 2009). Global acquisition is often engaged with the utilization of mobile devices. Furthermore, today mobile tools, especially smartphones, are prepared with built-in cameras, a quick processor power, a bigger screen and other instruments that might be utilized to present an AR acquisition experience (Billinghurst & Duenser, 2012). As AR might assist students with memorization, it is regarded to be a great equal for instructing culture as well as languages (Liu, 2009; Liu & Tsai, 2013).

3. Methodology

3.1 Participants

The subjects of this research contained 30 Iranian EFL female elementary students studying English in Kar Danesh vocational school. Their age ranges between 14-16 years old. They were selected based on intact group sampling

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because the participants were already members of the existing classes and it was not possible to divide them randomly into groups other than their own classes. In this way, two classes formed the two groups of the research (one experimental class of 15 and one control class of 15).

3.2 Research Design

The current research was of quasi-experimental type based on pre-test as well as post-test design, because process of random assignment was not used due to practical reasons (Mackey & Gass, 2005). In addition, because the gathered data was in the type of test scores, the current study was of a quantitative type. With respect to the variables of the study, it is obvious that the independent variable was augmented reality based instruction, and the dependent ones were students' vocabulary learning and retention.

3.3 Instruments

To obtain the aims of the research, the following instruments were used:

3.3.1 Vocabulary Pre-Test

The first instrument was students' vocabulary pre-test taken by all the subjects. The vocabulary pre-test in this study contained a list of 40 questions on vocabulary. The items were taken from McCarthy and O'dell (1999) book. The first 14 items were the fill-in the-blanks questions. The second 16 questions included match the words items in which students ought to match the words on the left with words on the right. And the last part included ten words required to be translated into Persian and be used in English sentences. The items were given one point each. These 40 vocabulary tests were given three times, first as a pretest and then after the treatment as a posttest. The test was also used as delayed posttest to check the retention of the vocabularies (See appendix A). The reliability of this test was calculated by KR-21 way and figured out to be .87. To assure the validity of it, three teachers tested whether the questions would sufficiently capture the idea they were going to assess.

3.3.2 Vocabulary Post-Test

A vocabulary post-test with the same content as the pretest was administered. The same as the pre-test, all the subjects participated in this test. They required to complete fill-in the-blanks questions, match the words items and also translate the words for this test. Furthermore, two weeks after the posttest, the participants retook the vocabulary test; these scores were recorded as their vocabulary retention scores.

3.4 Procedure

To respond the main research questions in the current study, first of all, the vocabulary pretest was conducted before the AR-based learning to test the learner's initial vocabulary level. Then, the experimental group received 12 sessions of augmented reality-based instruction, but the control class did not get the same training. The experimental class taught by using augmented reality-based instruction in the class in the teaching process. And the vocabulary was taught to both groups in 12 sessions. Throughout the application of the study process, the experimental and control classes learned the same vocabularies.

The following method was utilized with the experimental class:

Throughout the treatment, the subjects studied separately from the augmented reality centered instruction contextualized acquisition called *ARLOOPA* app using their cell phones. AR can be considered as a way which assists acquisition by different networks, containing audio, photo, text, video, and animation (Khodabandeh, 2022) that supports both instructors and learners so that boost the quality of education sources, and create reliable settings for the second language acquisition and instruction in perceiving and practicing abstract concepts, besides to ideas (Khodabandeh, 2022). This app presents the learning materials including virtual pictures, the meaning and pronunciation of word.

In the initial step of the study, the students were asked to install the ARLOOPA app on their cell phones and tablets, on which they met twice a week for learning the words together. The teacher found the words related to the first and second lessons in the students` course book from the app, and she took pictures or 30-second videos of the words from this app. It should be mentioned that the teacher used the online dictionary for the correct pronunciation of the words.

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Then she uploaded the audio version of the words in the app. After that the teacher taught the words through the computer or video projector while the students could check the pictures or videos of these words on their own cell phones. Therefore, the vocabularies used in the study accompanied several multimedia materials, such as 3D objects, 3D animations, with audios.

As for the present study, totally, fifty-seven 3D objects of words are presented by ARLOOPA. Every session five words were taught and each word includes 1-minute 3D animations supported by English pronunciation which are created using ARLOOPA. In the ARLOOPA application, the students can interact with the course content by using computer, mobile phone, that data projection. The following vocabularies that were borrowed from students course book Vision 1 were taught during the sessions:

Pole bear, Put out the fire, Cutting down the trees, Goat, Wolf, Tiger, Panda, Elephant, Whale, Lion, Cat, Zebra, Leopard, Whale, Duck, Cheetah, Gazelle, Giraffes, Sea animal, Cow, Shark, camel, Zoo, Building, School, Cinema, sea, Earth, Lake, Road, Human, Car, Computer, Planet, Mars, Jupiter, Neptune, Uranus, Mercury, Venus, Solar system, Ring, Telescope, Sun, Moon, Orbit, Body, Heart, Blood, Cell, White cell, Red cell, Blood cell, Microbes, Microscope, Virus, Bacteria, Fast food.

The experiment continued for an entire of 12 class time and a period of six weeks. The total treatment time for completing the vocabularies was 70 minutes. The following figures show some examples of the words were taught to the students by ARLOOPA app.



Figure 1. Examples of the words were taught to the students by ARLOOPA app

In the control class, the instructor trained the vocabularies without the assistance of augmented reality based instruction. After a talk clarifying the vocabularies, the instructor requested the learners to prepare one of the book tasks to test their perception, after that solved another task in groups or separately. Opposite to the experimental group, the vocabulary clarifications was done during the class time in the control group, so the instructor had to allocate some of the practices as homework, as there was not sufficient time to do all of the practices in class.

At the end, a vocabulary post-test was conducted to both groups. The same as the pre-test, all the subjects took part in the vocabulary post-test. This step intended to investigate the effect of the treatment. Furthermore, two weeks after the posttest, the participants retook the vocabulary test; these scores were recorded as their vocabulary retention scores. Finally, the results were analyzed and described in detail.

3.5 Data Analysis

After the necessary data was gathered, two kinds of statistical analysis were done utilizing SPSS software. Initially, descriptive statistics were conducted to report mean scores and standard deviations of the subjects. Moreover, as

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inferential statistics, an independent sample t-test was conducted to compare the mean scores of the two classes, and discover the impact of treatment.

4. Results

In this part, various analytical methods which were used to answer to the questions will be presented.

4.1 Descriptive Statistics

In the analysis step of this study, the obtained data including the vocabulary pre-test as well as post-test grades were analyzed using SPSS software. Descriptive statistics of the data presented data like group's means, standard deviations, normality, and frequency. Inferential statistics assisted us to check the study hypothesis. To this purpose, paired sample t-test and independent sample t-test were used. Paired sample t-test was run to probe any difference between the pre-test and post-test of each group. Independent sample t-test was employed to make comparison between the experimental and control group tests.

4.2 Results of Independent Sample T-test

Before starting any specific treatment to experimental and control classes, a pretest of vocabulary was administrated for both classes. The main aim of this exam was to show the participants proficiency regarding their vocabulary learning before the treatment. The same as the pre-test, all the subjects participated in the vocabulary post-test. This step intended to investigate the effect of the treatment. The descriptive statistics of these two groups' scores in pre-test as well as post-test of vocabulary are provided in table 1.

Table 1. Descriptive statistics of control and experimental group`s pre and post-test of vocabulary

	grouping	N	Mean	Std. Deviation	Std. Error Mean
pretest	control	15	29.8000	5.32112	1.37391
	experiment	15	30.5333	3.18179	.82154
posttest	control	15	30.1333	5.27618	1.36230
	experiment	15	34.1333	3.50238	.90431

The above table presented the results of descriptive statistics for both control and experimental class. As it is indicated, the mean scores of both groups were somehow identical in pre-test, however the experimental class mean was greater than the control group in post-test. Also, the standard deviation of control class was greater (std. control=5.32, std. experimental=3.18) in pre-test. And it was also higher (std. control=5.27, std. experimental=3.50) for control class in post-test. Table 2 shows the outcomes of independent sample t-test to see whether these findings were statically meaningful.

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Table 2. Results of Independent Sample T-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
pretest	Equal variances assumed	3.457	.074	-.458	28	.650	-.73333	1.60079	-4.01241	2.54574
	Equal variances not assumed			-.458	22.877	.651	-.73333	1.60079	-4.04582	2.57915
posttest	Equal variances assumed	2.379	.134	-2.446	28	.021	-4.00000	1.63513	-7.34941	-.65059
	Equal variances not assumed			-2.446	24.332	.022	-4.00000	1.63513	-7.37231	-.62769

Independent sample t-test presents the outcomes of Levene's exam to the variances uniformity. It intended to see if the scores scattering were the same for two groups in pretest vocabulary exam. The results of this exam proven the accurate T-value for the explanation of grades for the vocabulary exam. As the sig. is above .05, the first part in the table is mentioned (equal variances assumed). In Table 2, the significance level for the Levene's test was (α = .074). This was greater than the cut-off of (.05). It means that the postulation of equal variances had not been disrupted for the pretest grades.

Furthermore, as the number in the Sig. (2-tailed) section (α= .650) was also bigger than (.05), there was not substantial differences in the mean grades of the vocabulary exam for the control and experimental classes. Therefore, it can be decided that there was not statistically substantial difference in the groups means of vocabulary test (p>.05). It means that, the control and experimental classes were nearly at the same level of ability regarding their vocabulary at the beginning of the study.

Moreover, the statistics for the post-test showed that the significance value of the Levene statistics was (α= .134). The significance value was less than (.05), therefore, it might be interpreted that there was a substantial difference between the two classes regarding their vocabulary acquisition in the post-test (t (28) = -2.446, p =.00<.05). This outcome confirmed the outcomes of descriptive analysis in that there was a difference between the two classes considering the mean grades, i.e. the experimental class performed better than the control class in vocabulary acquisition.

Furthermore, two weeks after the posttest, the participants retook the vocabulary test; these grades were recorded as their vocabulary retention scores. The descriptive statistics of these two groups' scores in post-test and delayed-test of vocabulary are provided in Table 3.

Table 3. Descriptive statistics of control and experimental group`s post and delayed-test of vocabulary

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	Grouping	N	Mean	Std. Deviation	Std. Error Mean
Posttest	Control	15	30.1333	5.27618	1.36230
	Experiment	15	34.1333	3.50238	.90431
Delayed	Control	15	30.5333	5.18055	1.33761
	Experiment	15	35.9333	2.12020	.54743

The above table presented the results of descriptive statistics for both control and experimental class. As it is indicated, the mean scores of control class were somehow identical in post and delayed-test, however, the experimental group mean was greater than the control group in both post and delayed-test. And it was slightly higher in delayed-test for experimental group. Also, the standard deviation of control class was higher (std. control=5.27, std. experimental=3.50) in post-test. And it was also higher (std. control=5.18, std. experimental=2.12) for control class in delayed-test. Table 4 shows the outcomes of independent sample t-test to see whether these findings were statically meaningful.

Table 4. Results of Independent Sample T-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
posttest	Equal variances assumed	2.379	.134	-2.446	28	.021	-4.00000	1.63513	-7.34941	-.65059
	Equal variances not assumed			-2.446	24.332	.022	-4.00000	1.63513	-7.37231	-.62769
delayed	Equal variances assumed	6.960	.013	-3.736	28	.001	-5.40000	1.44530	-8.36056	-2.43944
	Equal variances not assumed			-3.736	18.562	.001	-5.40000	1.44530	-8.42989	-2.37011

In Table 4, the Levene's test significance level was (α = .134). This was greater than the cut-off of (.05). It means that the assumption of equal variances had not been disrupted for the post-test grades. Furthermore, the statistics for the post-test showed that the Levene statistics significance value was (α= .13). The significance value was less than (.05), therefore, it might be interpreted that there was a substantial difference between the two classes considering their vocabulary acquisition in the delayed-test (t (28) = -3.736, p =.00<.05). This outcome confirmed the findings of descriptive analysis in that there was a difference between the two classes considering the mean scores, i.e. the experimental class performed better than the control class in vocabulary retention. However, the mean score of experimental class was a little greater in delayed-test than post-test.

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4.3 Answering to the Research Questions of the Study

Q1: Does using ARLOOPA app and materials designed with augmented reality improve Iranian high school students ' vocabulary learning?

As it was indicated there was a substantial difference between the control and experimental classes regarding their vocabulary acquisition in the post-test. This outcome confirmed the findings of descriptive analysis in that there was a difference between the two classes concerning the mean scores, i.e. the experimental class performed better than the control class in vocabulary acquisition.

Q2: Does using ARLOOPA app and materials designed with augmented reality improve Iranian high school students ' vocabulary retention?

The results indicated that there was a substantial difference between the control and experimental classes considering their vocabulary acquisition in the delayed-test. This outcome confirmed the outcomes of descriptive analysis in which there was a difference between the two classes concerning the mean scores, i.e. the experimental class performed better than the control class in vocabulary retention. However, the mean score of experimental class was a little greater in delayed-test than post-test.

5. Discussion

The last part provided the outcomes of data analysis of the study. It has been demonstrated that there was a difference between the two classes concerning the mean scores, i.e. the experimental class performed better than the control class in vocabulary acquisition. Furthermore, the experimental class performed better than the control class in vocabulary retention. However, the mean score of experimental class was a little greater in delayed-test than post-test. The outcomes of the study are in line with results of other researches that proved augmented reality-based instruction had a significant impact on the acquisition (Chen et al., 2020; Eang & Na-Songkhla, 2020; Hsu, 2019; Tsai, 2020). Tsai (2020) examined the alterations in learners' English vocabulary acquisition act and the teaching sources motivation, contrasting the conventional instructing way and the AR way. The results indicated that the teaching sources motivation and act of the learners instructed utilizing AR were far better than the learners taught utilizing the conventional instructing way. The results of this study is in congruent with the results of Tsai`s (2020) study.

Furthermore, Chen, Wang, Zou, Lin, Xie, and Tsai (2020) worked on the impacts of captions as well as English ability in augmented reality on acquisition efficiency, motivation and attitude. Generally, students demonstrated positive motivation toward learning from the AR-enhanced contextualized learning. The results of Chen et al.'s study (2020) are also in agreement with the results of the current study.

Eang, and Na-Songkhla (2020) done a research on the outline of an AR-based teaching scheme model on the basis of the situated acquisition to improve learners' vocabulary ability. The outcome proposed a greater grade than pretest, indicating a significant difference. Hsu (2019) carried out a research on the impacts of gender beside to various augmented reality acquisition methods on elementary learners` vocabulary acquisition. The outcomes showed that the learners utilizing the two schemes had likewise high acquisition efficiency. This study is also in congruent with the results of these two studies.

However, the above-mentioned studies did not focus on the augmented reality-based instruction of EFL high school learners' vocabulary learning and retention and merely emphasized the role of the augmented reality-based instruction separately as an effective pedagogic means in English learning. It can be said that although the findings of the present study were in congruent with their findings, the present research provided more specified and detailed evidence regarding the impact of augmented reality-based instruction and sources made with AR on EFL students' vocabulary learning and retention.

As can be seen, previous studies confirmed the pedagogic value of augmented reality-based instruction without focusing on a specific skill. Consequently, the result of this study, in accordance with other research findings in this field, shed more light on the impact of augmented reality-based instruction and materials designed with AR on EFL high school learners' vocabulary learning and retention.

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6. Conclusion

It has been showed that there was a difference between the two groups considering the mean scores, i.e. the experimental group class performed better than the control group in vocabulary learning. Furthermore, the experimental group outperformed the control group in vocabulary retention. Though the mean score of experimental group was slightly higher in delayed-test than post-test. Regarding to the implications of the study, it should be mentioned that the outcomes of this research can be utilized for all shareholders of the area. According to the outcomes provided above, the results of this study have essential implications and propose some notions to autonomous students, English instructors, material developers, as well as policy makers which assist them in English language acquisition, and instructing.

Though the current study is methodically planned and its defined purposes were achieved, existing some unavoidable limitations upon research process is common. Expressing the limitation of the study in this part helps readers to make right overgeneralization. In addition, the researcher wants to propose next studies how to be improved. The first and foremost limitation is time-restriction which influenced the conduction of the project. The second limitation was that one of the main features of experimental study is randomizing the participants, but the participants has been enrolled in two classes in advance. Therefore, the researcher has not been able to select participants randomly.

Moreover, every study opens modern methods for more examinations. Therefore, on the basis of the limitations of the research, few suggestions might be created for conducting more study in the associated field. Since the efficiency of utilizing augmented reality based instruction was examined on the basis of its impact in developing students` vocabulary learning, it is necessary to do researches to investigate the effect of the augmented reality based instruction on the development of other language skills and sub-skills such as grammar, and pronunciation. It may be a great notion to conduct a similar study along to both male and female adult students at various levels of ability to see the effect of augmented reality based teaching as an acquisition means. The researchers can regard various elements such as students` intelligence, personality traits, aptitude, motivation, etc. that might impact students` vocabulary learning. Another research can be performed to examine the relationship between these factors and students` vocabulary learning.

In addition to AR and VR and other different media tools will be inseparable part of our life in the near future, thus these tools should be added to educational setting and adapted by old generation teachers because there was a fobia of using technology through ancient teachers and this is one of the most important aim of education is to make ready students to real life .These technological tools increase motivation and make students to be creative in EFL class. Creative environment prepares students to learn better and make education productive and enjoyable and also providing these environment is essential in language learning.

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Appendix A

English Vocabulary in Use Elementary Level Test

Fill the gaps in the sentences about free time at home

I like ..... magazines more than newspapers.
I ..... to my sister on the phone every Sunday.
A lot of people like to ..... a sleep after lunch.
Do you ever ..... friends to dinner?
The children ..... computer games every evening.
I want to ..... some music from the Internet this evening.
Did you ..... the programme about Namibia yesterday?
My dad ..... vegetables in his garden.
Shall we ..... a DVD tonight?

Match the words on the left with the words on the right. Draw lines.

With my computer I can get the sports news on the .....
Most young children don't read newspapers, they prefer .....
Accommodation in the city centre ..... expensive.
Spaghetti with Italian tomato sauce ..... very good.
The weather in Scotland ..... best in the autumn.
The news ..... better today than it ..... yesterday.
Work ..... the most important thing in Sam's life.
Their furniture ..... very old and very beautiful.

Translate the verbs into Persian and write a sentence about each verb.

1. Forest -
2. Human -
3. Apple -
4. Saturn -
5. Ring -
6. Drop -
7. Liquid -
8. Orbit -
9. Observatory-
10. Plain -

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