The Effect of Augmented Reality on Adult EFL Learners' Attitudes and Motivation: A Mixed Methods Study

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Abstract

Language education, among most other aspects of life, has been affected by the ever-advancing technology. To be most efficient, educators need to know the affordances technology brings to the teaching and learning process. Augmented Reality is a recent technology that can be accessed through the Internet and mobile phones and brings several advantages to the language classroom. This mixed-methods study aims to examine the effect of Augmented Reality on adult language learners' attitudes and motivation. To this end, data were obtained through a questionnaire administered to 40 adult EFL learners in Iran of different ages and educational levels who participated in a pre-test post-test design, followed by a semi-structured interview. Results confirmed that adult learners, disregarding their age and educational background, benefit from AR in the sense that it enhances their attitudes and motivation towards learning the language. The themes revealed in the interviews clarified that this enhancement is because AR is exciting to learners since it gets them

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engaged in the learning process and attracts them through gamification. Results of the current study have implications for language specialists and teachers to design and incorporate AR-infused materials in teaching to increase learners' motivation, and consequently, their learning.

Keywords: Augmented Reality, attitudes, motivation, CALL, MALL

With the rapid advent of technology, education is affected tangibly; precisely, with the Internet and mobile and tablet devices quickly accessing it. Nowadays, it is necessary to incorporate the latest advantageous technologies in education to support learners to benefit from their affordances. Augmented Reality (AR) is a new technology that has recently been integrated into education. It can form an interactive learning atmosphere that appeals to learners by enabling them to be in charge of their learning by interacting with digital objects in an authentic setting. Also, it can be considered the most recent advancement in Mobile-Assisted Language Learning (MALL).

Augmented Reality in education can be accessible via the Internet and primarily through mobile applications. AR applications can add features to the conventional curriculum. By this technology, for instance, texts, graphics, video, and audio can be superimposed on the real-time learning situations to make it richer and more elaborative.

There are many advantages to using Augmented Reality in education. One of the advantages is to boost learning motivation. Motivation has a significant role in learning and teaching processes (Budiman, 2016). Specifically, in second language learning and bilingualism, Gardner (1985) emphasizes the importance of attitudes and motivation as learning a language differs significantly from learning any other subjects at school. As Gardner points out, in language learning, learners are required to absorb the language, and within that process, they are asked to make the language part of their

behavioral repertoire. According to research, Augmented Reality can enhance students' motivation and improve educational practices through interacting with the real world (Lee, 2012).

Researchers attempted to examine the nature of the effect of AR on language education during the past years. Also, more precisely, some studies dealt with how AR affected learning motivation. These studies focused on different aspects such as language skills and components, learners, and the language learning process itself. However, as AR is still in its early stages, more evidence proving its helpfulness in language learning is required (Khoshnevisan & Le, 2018). Therefore, although previous studies added fruitful insights to the field, this study aims at seeking the topic with specific sets of data from different participants in a mixed-methods piece of research.

According to Khoshnevisan and Le (2018), most AR studies in the field of language learning focused on K-12 and college students are done so far. However, only a limited number of research studies are done based on the data obtained from adult learners of different ages and educational backgrounds. More specifically, the present study examines the effect of AR on language learning motivation in adult language learners of different ages and educational backgrounds. Moreover, according to the same authors, most studies followed a quantitative research approach to studying the usefulness of AR in language learning. In contrast, this study incorporates a mixed-methods design, incorporating quantitative and qualitative data collection and analysis modes to gain more valid and reliable results.

This mixed-methods study explores how AR affects attitudes and motivation in adult EFL learners in Iran. It should be noted that attitudes and motivation, as defined by Gardner (2004), are viewed as a unified whole and

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considered a single variable in the present study. It is guided by the following quantitative, qualitative, and mixed-methods research questions, respectively.

- Does employing AR in language teaching affect the attitudes and motivation of adult Iranian EFL learners?
- What are the attitudes of adult Iranian EFL learners toward using AR in learning?
- How do themes mentioned by adult Iranian EFL learners help explain the nature of the effect of AR on their attitudes and motivation towards language learning?

Literature Review

This study aims at investigating the effect of using AR on adult language learners' attitudes and motivation. Consequently, a brief review of the relevant literature is presented to see the current state of the topic in the body of research.

Augmented Reality in Education: Effects on Learners' Attitudes and motivation

In research, AR application in different domains of education has attracted quite a lot of interest lately. For instance, Kiryakova, Angelova, and Yordanova (2018) revealed the capacity of Augmented Reality to change conventional education into smart education. Many other authors have also examined the application and effect of using AR in different fields of education. Studies that integrate AR are limited in using this technology in the classroom. However, most of the studies reported that the application of AR in education was an encouraging learning experience.

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In this regard, Khan, Johnston, and Ophoff (2019) studied the effect of using an AR mobile application on undergraduate health science students, focusing on their motivation. Results revealed that employing AR improved the learning motivation of students.

Also, Delello, McWhorter, and Camp (2015) examined the use of an AR application, Aurasma, in higher education. They explored students' attitudes towards the use of AR in their studies. Findings showed that most of the students were contented with their experience with Aurasma as a whole.

Additionally, Küçük, Yılmaz, Baydaş, and Göktaş (2014) conducted a study with secondary school students to determine their attitudes toward using Augmented Reality in the classroom. Findings specified that learners' attitudes towards using such applications positively impacted the learning process and students' motivation.

Cai, Wang, and Chiang (2014) developed an Augmented Reality tool for teaching chemistry to high school students and examined its effect on their performance. The results proved that the developed AR tool was advantageous in enhancing students' cognitive performance in tests. Also, students, in general, held positive attitudes toward their learning experience using the AR tool.

Furthermore, Chiang, Yang, and Hwang (2014) examined the effectiveness of a mobile learning approach using Augmented Reality on elementary school students. Results disclosed that the approach improved students' learning accomplishments. In addition, it was revealed that the students who used the AR-integrated mobile learning methodology presented considerably higher motivation levels than those who experienced the conventional mobile learning method.

Finally, Salinas et al. (2013) applied AR in teaching mathematics. They used AR to promote visualization skills in this context. Results showed that using Augmented Reality increased learners' motivation. Moreover, students believed that their AR experience was simple, attractive, and practical.

In sum, as most studies revealed, employing AR-enhanced learners' motivation in education. Also, it was discovered that learners generally held positive attitudes towards using AR in learning different areas and subject matters.

Besides, as the above studies confirmed, AR provides the teaching-learning process with various benefits in diverse educational domains. As such, it also enhances language teaching and learning as a separate discipline. Different practices of incorporating AR in language education and their implications are studied in more detail below.

Augmented Reality in Language Learning: Effects on Learners' Attitudes and motivation

As perceived from the current literature, enhancing learners' motivation can be considered one of the most cited advantages of using Augmented Reality in the language classroom. Along with the effect of AR on language learning in general, its effect on language learning attitudes and motivation has also been studied, and positive results have been reported.

Several investigators have studied AR application in teaching and learning different language skills and components. For example, Lee and Park (2020) investigated how AR technology-facilitated language learning in college students. The study revealed that Augmented Reality reinforced language learning in different aspects such as affective, cognitive, and social domains.

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However, some studies examined the effect of AR on learner attitudes and motivation in language learning specifically. For instance, Chen et al. (2020) examined the effects of captions and English proficiency on high school students' motivation and attitudes in language learning. Results revealed that, in general, students demonstrated higher motivation levels in learning, with the more proficient learners having higher motivation levels.

Redondo, Cózar-Gutiérrez, González-Calero, and Sánchez Ruiz (2020) evaluated the application of AR in early childhood education and found that it improved early language learning. Results showed substantial progress in learners' motivation and their socio-affective relationships.

Also, another study on the effect of AR on motivation in vocabulary learning on primary school ESL learners revealed that AR has positive effects on learners' motivation (Vedadi, Abdullah, & Cheok, 2019).

Besides, Taskiran (2019) assessed language learners' experience regarding implementing AR-enhanced learning materials in language classes with a game-based approach. Results revealed that most of the students found AR-infused activities highly motivating and enjoyable.

Cheng (2017) examined the usefulness of incorporating Augmented Reality in language learning by engaging college students in an AR-integrated reading book. Results showed that, in general, those students who were reading the AR book felt less cognitive load. Also, they presented more positive attitudes and higher motivation levels than students who did not use AR in their reading activities.

Also, Solak and Cakır (2015) studied AR in language classrooms by investigating the correlation between motivation and academic achievement in undergraduate students who used Augmented Reality materials. Findings denoted that AR caused learners' motivation in learning vocabulary to

increase. Besides, they found out that there was a positive correlation between motivation and academic achievement while using AR materials.

Moreover, Li, Chen, Whittinghill, and Vorvoreanu (2014) studied the effect of Augmented Reality on the motivation level of Chinese students in learning vocabulary. The study's findings revealed that AR could enhance the motivation level of students in learning vocabulary.

Finally, Mahadzir and Phung (2013) investigated the effect of the application of Augmented Reality in promoting the grammar knowledge of language learners in primary school students. Results indicated that Augmented Reality could enhance the motivation level of students, which in turn resulted in a more effective and exciting learning experience for students, that could improve their performance.

According to the studies mentioned above, Augmented Reality has proved beneficial to language education through real-world contextualization of the learning. Also, other benefits like enhanced motivation and increased participation and collaboration on the part of students have been revealed.

Based on the objectives of this study, the available literature on the topic can be viewed according to the participants involved and the methodology adopted by the researchers. Regarding participants, some scholars (Taskiran, 2018; Solak & Cakır, 2015; and Li et al., 2014) incorporated graduate and undergraduate students to see if AR affects their language learning motivation and reported an increase in learning motivation by using AR. Besides, others (Chen et al., 2020; Vedadi et al., 2019; and Mahadzir & Phung, 2013) studied primary and secondary school students and revealed enhanced motivation levels after learning the language through AR-enhanced materials. Finally, some other researchers (Redondo et al., 2020) also investigated the change in preschool children's language learning motivation and claimed that AR

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materials boosted the motivation levels in such learners. However, few studies examined learning motivation in adult EFL learners of different ages and educational levels.

Moreover, regarding methodology, among studies that examined the effect of motivation on language learning, most studies adopted a quantitative approach like those of Solak & Cakir (2015), Taskiran (2018), Redondo et al. (2020), and Chen et al. (2020). Some other studies followed a qualitative approach, such as Mahadzir & Phung (2013) and Li et al. (2014). However, only a few such studies, like Vedadi et al. (2019), adopted a mixed methods methodology to bring about more reliable results.

As mentioned above, to the authors' best knowledge, few studies have been done on examining the effect of employing AR on EFL adult learners' attitudes and motivation outside formal academic settings such as colleges and universities. Besides, there is also a gap in the literature to investigate such an effect on adult EFL learners of different ages and educational backgrounds. Moreover, only a few studies have been done on considering AR-enhanced language learning in adult EFL learners, where language learning is considered as a whole, without focusing on single skills and components outside the formal educational settings in Iran.

Therefore, the current study aims to fill in the gap in the literature by investigating the effect of the application of AR in adult language learning with participants of different ages and educational backgrounds. Also, the study adopts a mixed-methods approach to gain more reliable results and benefit from both quantitative and qualitative modes of data collection and analysis.

Method

This study adopted an explanatory sequential mixed methods design that involved quantitative and qualitative data collection and analysis procedures. More details on participants, materials, procedure, and data analysis techniques adopted in the current study are presented below.

Participants

Participants of this study were 40 male and female adult intermediate-level learners attending a general English course in a language institute in Iran. The sample was randomly selected and also randomly assigned to the two control and experimental groups. Regarding gender, 50% of participants were males (n=20) and 50% were females (n=20). Their age ranged from 20 to 50 with the following distribution details. Among all participants, 35% were 20-30 years old, 50% were 31-40 years old, and 15% were 41-50 years old. Furthermore, participants' education levels ranged from high school diploma to Ph.D. As such, 15% had a high school diploma, 35% had a Bachelor's degree, 35% had a Master's degree, and another 15% had a Ph.D. degree. These details confirm a variety in participants' age and educational levels, a fact which has not been focused upon previously by the researchers in the field. Table 1 illustrates the demographic information of the participants.

Table 1

Demographic Information of the Participants

Name	Gender	Age	Education	Name	Gender	Age	Education
Mahsa	Female	28	Diploma	Shiva	Female	32	Bachelor's
Mohammad	Male	49	Ph.D.	Mahroo	Female	25	Bachelor's
Shaahin	Male	24	Master's	Ray	Male	28	Master's
Shima	Female	26	Bachelor's	Bob	Male	38	Ph.D.

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Name	Gender	Age	Education	Name	Gender	Age	Education
Max	Male	35	Bachelor's	Zila	Female	43	Master's
Saeed	Male	36	Master's	Farshad	Male	34	Master's
Neda	Female	23	Bachelor's	Maryam	Female	32	Master's
Davood	Male	37	Master's	Hedye	Female	35	Ph.D.
Arsalan	Male	27	Diploma	Amin	Male	35	Bachelor's
Niloo	Female	33	Bachelor's	Mojgan	Female	42	Diploma

Moreover, to ensure homogeneity of the sample regarding the level of English at the time of running the study, the students were chosen from among those who had already passed the previous level English course at the same institute. So, their scores on the previous level's final exam served as the pre-test scores in the current study.

Materials

Several materials and instruments were used for data collection in this study. First, the instructional material was Interchange 1 coursebook 5th edition. The conventional paper version of the book was used for the control group, and the experimental group used an AR-infused version of the same book developed for the specific purpose of this study. In the AR-enhanced book, all four skills were enriched with Augmented Reality in a variety of ways. For example, in listening, the audio, relevant pictures, new vocabulary, and follow-up questions were accessible to the students when they scanned the relevant code with their mobile phones. In speaking, students could get hints and functional vocabulary and upload their oral assignments to the teacher through AR. Also, in reading and writing, hints to improve skills and helpful words and phrases were embedded. Besides, students were able to upload their reading summaries and writing assignments through AR.

The AR-enhanced input was created through an online workplace called ZapWorks, which students could access through the Zappar application installed on their mobile phones. These AR features acted like resources that helped learners get more enriched input in different formats, which aided them in learning each section of the lesson.

By scanning each code, relevant information would appear on the screen of the mobile phone or tablet. While scanning the code and looking at the mobile phone or tablet screen, one could see the reality, i.e., the book page and the added AR feature, one or more virtual features developed through ZapWorks. Learners could use the AR feature as long as they held their device camera about the mark. By moving the device, the AR feature would disappear, and the learner could access reality alone.

The input provided to students in the experimental group in AR materials was the same as what control-group learners received from the teacher during studying. The only difference counted was the mode of delivery in the two groups: through teacher's voice, written texts, and played multimedia in the conventional group and AR-infused in the experimental one.

Second, assessment materials used in this study included a questionnaire as well as a semi-structured interview. Gardner's (2004) Attitudes/Motivation Test Battery (AMTB) was adopted and employed to assess the attitudes and motivation of learners toward their learning experience. Because the original form of this questionnaire is very lengthy, including 104 items, the shortened version proposed by Dordi-nezhad (2015) was implemented in the present study. The short version includes 37 items, making it easier to attract participants' collaboration to get it filled up. The questionnaire was checked to ensure reliability through a pilot study reported in the following section.

Moreover, in order to get a more thorough insight into the learners' experience and engagement in using AR in their learning, a semi-structured interview was done with participants in the experimental group in order for them to be able to reflect on their learning experience. Interview questions were proposed by the researchers based on experience and the relevant literature and validated by the panel of experts in this study, including five Ph.D. holders in TEFL.

The questionnaire and the oral interview questions were offered to the participants in their mother tongue, i.e., Farsi. The reason was that participants in this study were not advanced level English speakers, so the researchers could not make sure about correct comprehension on the part of students if they were to be administered in English. Therefore, the translated versions of tools were used. They were validated and modified before administration by the panel of experts.

Procedure

The data collection process in this study followed a particular procedure described below. First, participants were randomly assigned to each of the two control and experimental groups. Both groups then went over 20-session courses as defined by the institute's program. The same teacher taught both groups to control instructor variability effects.

For the experimental group, the first session contained introductory issues and the required instructions on the materials and procedures of AR-integrated learning. During class hours, free Wi-Fi Internet was offered to the learners to use the Zappar application smoothly. Also, the app was installed and tested on learners' mobile devices in the very first session. Besides, the

course instructor was also trained on implementing the AR features fluently in the class before starting the intervention.

Consequently, to assess learners' attitudes and motivation, Gardner's (2004) Attitudes/Motivation Test Battery (AMTB) was administered to the learners in both groups in the first and last sessions of the course. The experimental group then experienced the AR-enhanced and the control group with the conventional paper course book for 20 sessions. After the completion of the course, learners were post-tested in the final session. The post-test consisted of a re-administration of the AMTB questionnaire. Also, participants in the experimental group were individually interviewed on their experience in language learning employing AR and asked to reflect on what they had gone through during the course to acquire a comprehensive view of the total experience on the side of the learners. After the data collection phase, obtained data were analyzed through proper quantitative and qualitative analysis techniques. In summary, the experiment procedure adopted in this study is schematically shown in Figure 1, clarifying the three pre-test, intervention, and post-test steps.

Figure 1

Data Collection Procedure
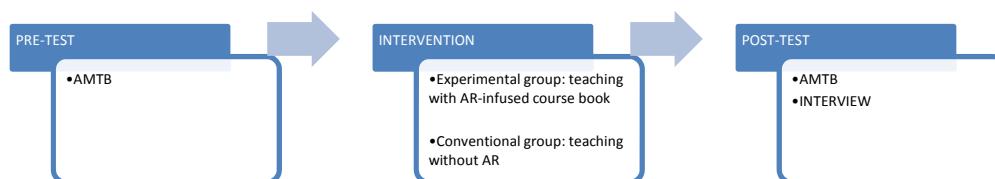
Data Analysis

Analysis of covariance (ANCOVA) was used to analyze the quantitative data obtained in the study. Data gathered through questionnaires at the two administrations were analyzed using ANCOVA via SPSS to observe AR's effect on learners' attitudes and motivation. Based on the SPSS Survival Manual (Pallant, 2007), ANCOVA is used in designs with a pre-test and post-test. For example, it can be used when comparing the effect of two different interventions, taking before and after measures for each group. In this case, pre-test scores are considered a covariate to control pre-existing differences between the groups.

This feature makes ANCOVA very useful in situations with relatively small sample sizes or medium effect sizes. So, since the sample size in this study was not significant, this analysis method was chosen to ensure reliability. Besides, data gathered through oral interviews with learners in the experimental group were analyzed via thematic analysis to specify the recurring themes in learners' experience in applying AR in language learning.

Results

Validity and Reliability of Data Collection Tools

Before administration, data collection tools were checked for reliability and validity. First, the Farsi version of the AMTB adopted from Dordinejad (2015) was checked to be face and content valid by the panel of experts in this study. The tool was pilot tested with 20 students before the beginning of the course to assess its reliability. Reliability was examined via Cronbach's alpha both in the pilot test and in the study's actual data collection phase. Table 1 presents the results of the reliability check for this tool.

Table 1

Reliability of AMTB

Cronbach's Alpha- Pilot Study	Cronbach's Alpha- Main Study
0.74	0.78

As shown in Table 1, the reliability of the AMTB was 0.74 in the pilot test and 0.78 in the data collection phase. As a result, since a Cronbach's alpha level higher than 0.7 is considered acceptable in reliability level, the tool proved reliable in the pilot test for data collection for this study.

Furthermore, both in English and Farsi, interview questions were also piloted and scrutinized by the panel of experts. The questions were pilot tested with five learners before administration. Results from the pilot study provided helpful feedback for the actual study and resulted in some changes in the questions. Consequently, the changes included rephrasing and replacing some of the questions. They were double-checked by a panel of experts to ensure content validity and then used in the actual study.

Quantitative Data Analysis: Questionnaire

In this study, both quantitative and qualitative data were gathered, which required their relevant analysis techniques. First, the quantitative data gathered through the questionnaire were analyzed using ANCOVA. Next, the qualitative data obtained through the interview was examined through thematic analysis. Finally, the results of these two types of analysis were integrated to answer the mixed-methods research question leading this study.

Initially, analysis of covariance (ANCOVA) was used to analyze the data obtained through the questionnaire. Nevertheless, first, as an assumption in

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the analysis of covariance, a normality test was done to make sure ANCOVA is the suitable analysis method regarding the data at hand.

First, to ensure the satisfaction of the normality assumption, the Kolmogorov-Smirnov (K-S) test was performed on research variables. Table 2 presents the result of the normality test (Kolmogorov-Smirnoff). As can be deduced from the findings in Table 2, since the significance level obtained in the test (K-S) was larger than the criterion value of 0.05, it can be concluded that the distribution of the variables understudy in the statistical sample was normal; so, ANCOVA can be suitably done to analyze the data.

Table 2

Kolmogorow-Smirnov Test of Normality

Variable	Statistic	Sig.
AMTB Post-test	0.171	0.09

Consequently, to see if Augmented Reality enhanced the attitudes and motivation of Iranian EFL learners toward learning the language, first, Levene's Test of Equality of Error Variances was employed in order to test the homogeneity of the regression coefficients, the results of which showed that homogeneity was established (F=3.39, Sig.=0.07). Then, Table 3 summarizes the mean scores of both groups' pre-tests and post-tests. As Table 3 shows, the experimental group had a higher mean score after the experiment (mean=4.57) than the control group (mean=3.41).

Table 3

Attitudes and Motivation Descriptive Statistics

Group	Mean	SD	N
Control	3.41	0.50	20
Experimental	4.57	0.14	20
Total	3.99	0.69	40

Then, to check whether this difference was statistically significant, a one-way between-groups analysis of covariance (ANCOVA) was conducted. Participants' scores on the pre-test were used as the covariate in this analysis. As Table 4 shows, after adjusting for pre-intervention scores, there was a significant difference between the two intervention groups on post-intervention scores ($F = 92.718$, $p = 0.000$, partial eta squared = 0.715).

Table 4

Attitudes and Motivation ANCOVA Results

Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected model	18.059	2	9.029	464.899	0.000	0.962
intercept	0.119	1	0.119	6.110	0.018	0.142
Pre-test	4.544	1	4.544	233.950	0.000	0.863
group	1.801	1	1.801	92.718	0.000	0.715
error	0.719	37	0.019			
total	656.557	40				
Correct total	18.777	39				

As is evident in the Table 4 above, there was a strong relationship between the pre-intervention and post-intervention scores on AMTB, as indicated by a partial eta squared value of 0.715 based on Cohen's guidelines (1988).

Qualitative Data Analysis: Oral Interview

A semi-structured interview was done with the learners in the experimental group to get more understanding of the learners' experience of the AR-infused language learning. It consisted of six open-ended questions through which learners could reflect on what they thought of their experience. Their oral responses were transcribed and went through thematic analysis procedures. The results will answer the following research question.

• What are the attitudes of adult Iranian EFL learners toward employing AR in language learning?

The results of the thematic analysis revealed several recurrent themes in learners' responses. They can be categorized as the novelty of the experience, positive aspects, and challenges and limitations, which will be discussed below.

The Novelty of the Experience

First and foremost, the experience of using AR for educational purposes was novel to all the participants. Although a few participants had experienced the technology in mobile games as one interviewee (Shahin) claimed: "I used a similar concept in Pokémon Go game years ago which added an animated picture to the real world," and in some social media mobile applications as reported by another interviewee (Mahsa): "I use it a lot in Snap Chat. It includes some filters which are added to your face when you want to take selfies". Also, another participant (Shiva) had experienced using it in a fashion design company opening event: "We had to download an application on our mobile phone, and through it, we could see the virtual fashion shows as if they were running there in the hall we were standing." In contrast, none of the participants had used Augmented Reality for learning and educational purposes.

Positive Aspects

The majority of participants (17 out of 20) held positive attitudes toward the AR experience. First, the most recurrent theme in students' responses regarding this category was that most interviewees felt it was fun to use AR in teaching and avoided being bored. As one participant (Mohammad) mentioned:

It was an enjoyable experience to use technology in this way in language learning. I never felt bored during the course, but I usually felt bored in all other language classes. Also, when I accessed each feature for the first time, I felt surprised, and it made me kind of happy and energetic in the class. Also, it was like playing games and learning at the same time.

Also, another participant (Mahnoosh) claimed that "Using this method was so interesting that I couldn't realize how the class time was passed. All the time, I was waiting for a new mark to be scanned so that I could see what was hidden behind it."

This feature made the learning environment "less formal," thus "reducing stress and apprehension in learners," as another participant (Amin) claimed. Also, using this technology, "learning was, in part, similar to a game for students and prevented them from getting bored during the class," as mentioned by some other participants (like Mohammad and Bob).

60% of the interviewees mentioned the second recurrent theme was the ease of access to resources whenever they felt like they needed them. They claimed that they enjoyed the way they could readily access the extra content or materials in each activity by just scanning a code via their mobile phones. For example, as mentioned by Zila, "I could easily access the online dictionary by scanning a code when studying the reading passage. It was much easier

than opening the browser or dictionary app on my phone". Also, as another participant (Davood) claimed:

Where needed, especially in writing sections, there were some reminder grammar points which I could see easily by scanning the code available there. It was very helpful because it was like a review of that point, and also, I did not need to go to previous lessons to check that grammar if I had a question on it.

Third, students (10 out of 20 participants) found the AR-integrated experience engaging and encouraging. For instance, an interviewee (Neda) stated that "doing something in the class made her feel better than merely listening to the teacher and doing some pair work." Also, some participants like Mahnoosh and Arsalan found it like "a sense of adventure or discovery which motivated them to look for more," at least in the first use of each AR mark. Besides, as another participant (Ray) mentioned, these features resulted in more engagement and motivation to learn:

The fact that we were busy using our mobile phones to scan codes and manipulate the content that appeared to us through scanning the codes kept us engaged in learning, and I felt I learned better and always wanted to learn more.

Finally, a less common theme found in students' responses (6 out of 20 participants) was to experience a modern and unique learning process. As an example, one participant (Shima) claimed that "I felt that learning the language using my mobile phone most of the time and through such a new and interesting technology was a modern and unique experience compared to the other language classes I had experienced." Some other participants (like Hedye and Maryam) preferred such a learning environment "where new technology is being employed that students can benefit from." Finally, in this

regard, some participants (like Niloo and Amin) claimed they would recommend their friends to enroll in such classes to enjoy the same experience.

Challenges and Limitations

There were also some challenges and limitations reported in learners' responses. A dominant theme in this category was related to the facilities and expertise or instruction in accessing the AR features. 50% of the participants believed that the learning experience could be affected by the "type", "availability", or "quality" of the facilities. For example, one participant (Farshid) claimed, "If my mobile phone had a larger screen, I could have a better experience to read the written content." "Although this could be resolved to an extent by moving the device back and forth," as he reported, "it took time for me to discover such a feature and made me a bit disappointed at the beginning."

Also, as stated by another participant (Hedye): "older mobile devices with lower functioning speed might make the experience a bit time-consuming." Besides, "internet access in general" and "low internet speed" can be considered as other limitations in AR-enhanced language learning, as mentioned by another participant (Ray).

Finally, the lack of interest in technology is a challenging factor in employing AR in language learning. With this regard, three students (Mojgan, Max, and Saeed) asserted that they could not prefer the AR experience because they "did not like" or "felt comfortable with technology" in general. One of them (Mojgan) felt "somehow indifferent" to it and thought "it was not crucial to be used in the classroom." Also, as Saeed stated, "it could be a sort of game or fun experience in the class, but that learning could still occur

without implementing it." In this sense, using such a technology in the language classroom was thought of as "unnecessary," as mentioned by Max.

Discussion and Conclusion

Concerning the results mentioned above, the analysis of quantitative data showed that Augmented Reality enhanced the motivation level of the participants. Also, qualitative data analysis confirmed this fact and provided more input about the learners' attitudes towards their AR-infused language learning experience.

According to the results, participants' learning attitudes and motivation in the experimental group were enhanced after the AR learning experience compared to the control group, who followed the conventional experience. This enhancement is due to the motivating and encouraging effect of AR in education, as confirmed, for instance, by Khan et al. (2018), who proved AR to be motivating to health science students; Dellelo et al. (2015) who resulted that higher education students had positive attitudes towards their AR-infused learning experience in their study.

Besides, the same boosted attitudes and motivation results were obtained by Chen et al. (2020) in their study of high school students' attitudes and motivation in AR-enhanced language learning; and by Solak and Cakir (2015), who concluded that undergraduate students' enhanced motivation in the language classroom correlated positively with their achievement when using AR-enhanced materials.

Another significant fact to be considered is that the previous literature on the topic only examined the effect of AR on adult learners' attitudes and motivation with specific age and educational levels. Therefore, it could have been perceived that, for example, AR could only enhance those adult learners'

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attitudes and motivation who are supposedly graduate or undergraduate adults in their 20s, as reported by Taskiran et al. (2018), Solak and Cakir (2015), Li et al. (2014). However, as the results of this study clarified, adult learners of different ages and educational backgrounds in informal educational settings also benefit from enhanced attitudes and motivation in AR-infused language learning. Such a benefit is not limited to adult learners of specific age and education level studying informal settings.

These findings can explain whether employing AR in language teaching affects the attitudes and motivation of adult Iranian EFL learners. Based on the analyses, the study results denote the usefulness of AR in language teaching in terms of enhancing students' attitudes and motivation. More specifically, in responding to the quantitative research question, it is found that AR affected the attitudes and motivation in adult Iranian EFL learners regardless of the variety in their age and educational background. Moreover, this effect was positive, i.e., the motivation boosted in students who experienced AR in their language learning.

Next, as already mentioned above, results clarified some dominant themes regarding students' attitudes towards the AR-integrated experience, which explicates adult Iranian EFL learners' attitudes towards using AR in language learning. First, AR was a new experience for all students, and the majority of learners found it exciting and were eager to experience it again in the future. Second, although some learners had experienced AR in a few social media and game apps, none had used it for educational purposes. Finally, most students liked the experience and found it helpful in language learning because it provided more exciting and versatile input for them, made the class more engaging and enjoyable, and let them pass the class time without getting bored.

Moreover, only some students reported drawbacks in using AR in language learning. One flaw was that they were not eager to use technology in any domain of their lives. Another aspect was that some needed more time to deal with the AR technology due to their lack of interest or proficiency. So, they found it time-consuming and thought it was not a necessary thing to do. Besides, students found some limitations and challenges in using AR in language learning. For example, the small mobile phone screen size was why some learners did not feel comfortable with the experience. Also, dealing with technology, the Internet, and mobile phones to get more of their capacities was a burden due to lack of sufficient technology literacy.

Finally, the above discussion elaborates on how the themes mentioned by the adult Iranian EFL learners help explain the nature of the effect of AR on their attitudes and motivation. As revealed by the study results, Augmented Reality enhanced learner attitudes and motivation toward language learning. According to the interview results, learners who found AR more interesting than conventional learning, considering its capacities to the language classroom, got more motivated to learn the language. As perceived through the results of quantitative data analysis, Augmented Reality enhanced learning motivation in adult EFL learners. As stated in the interviews, using AR was an engaging experience for the learners since it integrated studying with gamification and required active learner participation and attention. A second reason was that learners got engaged in the learning process by doing physical tasks, discovering beyond AR codes, and proceeding to the language tasks accordingly during class time. This was rewarding as they felt responsible for their learning.

Results of the present study were consistent with previous relevant research found in the literature in that using AR-enhanced motivation in

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language learners. In the same vein, Chen et al. (2020), Vedadi et al. (2019), Taskiran et al. (2018), Cheng (2017), Solak and Cakir (2015), Li et al. (2014), and Mahadzir and Phung (2013) reported that AR increased motivation in language learners. However, this study was different in terms of participants and methods from other pieces of research. For example, while some previous studies focused on school students (Chen, 2020; Vedadi, 2019; and Mahadzir & Phung, 2013), and some on university students (Taskiran et al., 2018; Solak & Cakir, 2015; and Li et al., 2014), the present study involved adults regardless of their age and educational background.

Also, while most previous research adopted a quantitative approach to study the effect of AR in language learning (Chen, 2020; Taskiran, 2018; and Solak & Cakir, 2015), and some followed a qualitative approach (Li et al., 2014; and Mahadzir and Phung, 2013), this study adopted a mixed-methods research approach, in line with the approach adopted by Vedadi et al. (2019).

Overall, the current study aimed to investigate the effect of AR on the attitudes and motivation of adult Iranian EFL language learners. To this end, a mixed-methods two-phase study was designed. It incorporated an experimental pre-test post-test study followed by a semi-structured oral interview. The study participants included 40 male and female adult Iranian EFL learners enrolled in a general English course. They were randomly chosen and assigned to two control and experimental group. Participants' attitudes and motivation were examined at the beginning of the course. Then, the experimental group went over an AR-enhanced language learning course while the control group experienced the conventional one. The study results indicated that Augmented Reality has high effectiveness in improving learners' attitudes and motivation toward language learning among adult Iranian EFL learners.

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The study has implications for English language teachers. They are recommended to consider using AR for English language learning, especially in this age of technology, use AR to teach all language skills and sub-skills, participate in workshops and courses that allow them to use technology, especially AR, efficiently in teaching. Also, the study has implications for language supervisors and program developers. They are suggested to run teaching sessions and workshops to teach language instructors how to use AR in language teaching, inform teachers of AR's possible advantages and affordances in language teaching, and incorporate AR-infused teaching materials in the syllabi.

Besides, there were some limitations to this study. First, AR is most frequently found in games and media. Therefore, it was challenging to make participants use it for learning. In addition, AR is a new instructional tool, and not all learners, teachers, and language institutes are ready to use it. As mentioned earlier, proper facilities are required for attaining the maximum capacity of AR in learning. Besides, not all teachers are comfortable working with technology, and teacher reluctance is integral in encouraging learners to employ the tool as much and effectively as needed.

Finally, in light of the results of the study, recommendations for further research are as follows. First, the effect of using AR on teaching each language skill and sub-skill to adults should be studied. Second, the effect of age, background education, and technology literacy should be studied in adult learners when implementing AR-infused language teaching. Third, conducting studies while incorporating a larger number of participants is encouraged to get more generalizable results.

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Appendix A: Interview Questions

The following questions were used as interview questions in this study:

1. Have you ever had a similar experience of using AR for learning?
2. How do you feel about the experience you had about using AR in language learning?
3. What did you like about using AR in English language learning?
4. What you disliked about using AR in English language learning?
5. What do you think about the possible limitations and challenges of using AR in English language learning?
6. Do you like to have the same experience of using AR in your language learning?
7. Is there anything you want to add?