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Breaking down the Classroom Walls: Augmented Reality Effect on EFL Reading Comprehension, Self-Efficacy, Autonomy and Attitudes

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Abstract

This study aimed at investigating the effect of Augmented Reality (AR) on college-level EFL students' reading comprehension, self-efficacy, autonomy and attitudes. It also examined the relationships between self-efficacy, autonomy and attitudes. The sample consisted of (59) male students: an experimental group (n=30) and a control group (n=29), studying English for Academic Purposes at Taif University, Saudi Arabia. The study employed the quasi-experimental approach using a pre-post, nonequivalent control group design. A reading comprehension test, a self-efficacy scale, an autonomy scale and a questionnaire for attitudes were designed to gather the data. The findings indicated that there was a significant difference between the two groups in the reading comprehension post-test in favor of the experimental group. Also, there was a statistically significant difference between the mean score of the pre and post administration of the self-efficacy scale in favor of the post administration. Besides, there was a statistically significant difference between the mean score of the pre and post administration of the autonomy scale in favor of the post administration. The results of one-sample T Test showed that all attitudes items were statistically significant and the grand mean score was statistically significant which indicated that students had positive attitudes towards using Augmented Reality in language learning. Finally, positive significant relationships between students' self-efficacy, autonomy and attitudes were found.

Keywords

English language, reading comprehension, Augmented Reality, self-efficacy, autonomy, attitudes

1. Introduction

Language is powerful since it allows people to access knowledge, communicate and learn from others. It is complex, so that learners of English as a foreign or second language experience different complexities and challenges (Mora-Flores, 2011). One of the most important skills of a language is reading comprehension because it enables learners to comprehend what they read, learn others skills and increase their academic achievement. Reading is an extraordinary achievement in which number of levels and components must be mastered. Learners have to master words that contain graphemes, phonemes, and morpheme and comprehend sentences that have syntactic composition, propositions, and stylistic features (Graesser, 2007). Reading comprehension is a highly complex process that involves many interactions between readers and what they bring to the text (previous knowledge, strategy use) as well as variables related to the text itself (interest in text, understanding of text types) (Klingner, Vaughn, & Boardman, 2015). Different abilities are involved in reading comprehension and these abilities are "quite complex and that they vary in numerous ways depending on tasks, motivations, goals and language abilities" (Grabe & Stoller, 2013, p. 13). The most significant difficulties that face EFL learners are phonological awareness, orthography, vocabulary and decoding (Shore & Sabatini, 2009). Moreover, "the complex interaction among the comprehension components and the role of motivation for reading make real gains difficult to achieve" (Perfetti, Landi, & Oakhil, 2005, p. 245). Other factors include: poor mastery over vocabulary, weak sentence structure and tenses, lacking the skill of inferring the meaning from context, and a lack of interest from both sides: from teachers and students in developing reading skills (Iqbal, Noor, Muhabat, & Kazemian, 2015). Besides, limited practice time that students have outside the classroom, lack of motivation in English learning activities, and absence of learning opportunities in actual circumstances are of the main factors that affect students' learning outcomes (Liu, Tan, & Chu, 2010).

University-level Saudi learners have major problems in reading comprehension skills. Nezami (2012) identifies the major problems in the use of vocabulary, scanning, skimming, prediction and summarizing in the process of comprehension of English language, lack of motivation, self-study activities and collaborative work. Other reading problems of Saudi EFL learners include lack of concentration, lack of retention, poor comprehension and lack of speed. Students stated that the texts they were given to read were not interesting, and the procedure for their reading lessons was unchanging and inflexible. Besides, it was apparent that the students' primary motivation for learning English was pragmatic (Al-Nooh & Mosson-McPherson, 2013). Beside the above mentioned problems, Al-Qahtani (2016) stated that lack of exposure to target language, poor teaching skills and teacher training programs, little attention to comprehension and more attention to reading aloud, little emphasis on reading skills in textbooks, lack of reading skills training for students were the most important factors behind Saudi students' poor reading abilities.

New Media shape practices and opportunities in foreign language classrooms along with problems that have always accompanied foreign language learning and teaching. According to the 2009 PISA results,

the percentage of students who have at least one computer at home has grown considerably (Piasecka, Adams-Tukiendorf, & Wilk, 2015). Moreover, educators have more educational technological tools than at any time in history due to the increasing of new technologies, mobile devices, applications, and other innovations available for the delivery and creation of instructional content (McMahon, 2014). The existed research also assures the advantages and uses of the new technology in language teaching and learning. Banks (2008) argued that in the new millennium, teachers need to understand the variety of methodologies available to them and use a hybrid of strategies including technology, projects, communicative activities and more. Besides, Marzban (2011) claims that CALL provides the technical and logistic support for the fulfillment of theoretical tenets of communicative approach which emphasizes a more humanistic and individualistic learning. Augmented Reality (AR) is one of the newest movements that appears as a result of the dominance of technology, particularly mobile applications, in the last few years. AR takes digital or computer generated information, whether images, audio, video, and touch or haptic sensations and overlays them over in a real-time environment. AR can be used to enhance all five senses, but its most common use is visual (Kipper & Rampolla, 2013). AR depends on hardware that is able to capture information about the real world, such as video, position data, orientation data, and to play back a display that mixes live media with virtual content in a way that is meaningful and useful to users (Mullen, 2011). AR is interactive; people must engage with it to gain more experience. AR can support many different application areas; it can be applied in education, entertainment, medicine, and many more areas (Craig, 2013). AR technology increases student motivation in educational settings: interaction support (15.63%), collaboration (18.75%), low cost (12.50%), increasing the experience (12.50%), just-in-time learning (12.50%) and exploration of the real world (12.50%) (Uluyol & Sahin, 2016).

Realizing the importance of the new technologies in teaching the English language, especially the Augmented Reality, Viberg and Gronlund (2012) confirmed the lack of empirical studies providing concrete evidence on how mobile technology use could enhance individual's language learning results. They suggested that more experimental cases were needed to assist and improve learners' reading comprehension. Darmi and Albion (2014) also recommended further studies on improving language skills depending on the recent design and features of mobile phones. Moreover, Miangah and Nezarat (2012, p. 315) assured that mobile learning could be "an ideal solution to language learning barriers in terms of time and place" and mobile learning programs that reading accompanied by text announcer pronunciation would be more helpful to promote reading comprehension. Confirming the advantages of mobile use in learning, Gilgen (2005, p. 39) stated that, "when we create an environment that enables students to go to original sources, supplementing and complementing our language-learning-specific resources, then the world itself becomes a language lab without walls".

As mentioned above, there is an urgent need to keep pace with the technological developments in the field of teaching and learning English as a second or foreign language. So this study aims to investigate the effect of Augmented Reality on students' English language reading comprehension, self-efficacy

and autonomy. Self-efficacy and autonomy are chosen since Augmented Reality is a kind of student-centered learning inside and outsides the classroom which may affect students' self-efficacy and autonomy. The current study also examines students' attitudes toward using Augmented Reality in learning English language and the relationships between self-efficacy, autonomy and attitudes. The results of this study may help learners, instructors, administrators, curriculum developers to benefit from findings in enhancing students' learning a new language. The study tests the following hypotheses:

H1: Augmented Reality can improve students' reading comprehension.

H2: Augmented Reality can improve students' reading comprehension self-efficacy.

H3: Augmented Reality can improve students' autonomy.

H4: Students will have positive attitudes towards using Augmented Reality in language learning.

H5: There are significant relationships between students' self-efficacy, autonomy and attitudes.

2. Literature Review

To gain deeper understanding of the Augmented Reality, the study focuses mainly on some aspects which can be undertaken and discussed in brief.

2.1 Augmented Reality (AR)

Augmented Reality (AR) is one of the recently prevailed technological concepts that has a considerable attention in medicine, commerce, industry, entertainment and education. Historically, AR has gone through a number of developments. In 1962, Morton Heilig designed a motorcycle simulator which stood as one of the earliest known examples of immersive, multi-sensory technology that had visuals, sound, vibration, and smell. In1968, Ivan Sutherland created the first Augmented Reality system which used an optical see-through head-mounted display. Later, in 1975, Myron Krueger created an Augmented Reality system which allowed users to interact with virtual objects for the first time. Finally, in 1992, loin Caudell and David Mizell at Boeing's Computer Services' Adaptive Neural Systems Research and Development, designed software to help Boeing's manufacturing and engineering process that could lead to the positions of where certain cables in the building process were supposed to go (Kipper & Rampolla, 2013). AR is defined as "a live, direct or indirect, view of a physical, real-world environment whose elements are augmented by computer-generated sensory input such as sound, video, graphics, or CPS data" (Koch, 2016, p. 124). Figure 1 illustrates the Reality-Virtuality continuum proposed by Milgram and Kishino (1994).

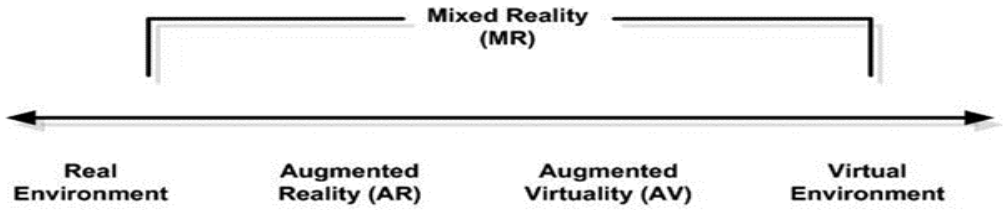

Figure 1. Reality-Virtuality Continuum

Augmented Reality (AR) is different from Virtual Reality (VR) in the way that AR deals with real objectives modified by computer or smart phones applications and objects such as images, animation, graphics or sounds, whereas VR deals with real-world objects which are simulated and created and users interact completely with these objects (Koch, 2016; Uluyol & Sahin, 2016). There are two basic modes in which the digital world and the physical world can be merged. The first mode is to meld the information gathered from the physical world with the generated digital information together in a computer to be displayed. The second one is to project the augmentations onto the physical world by means of projection devices (Craig, 2013). Moreover, Azuma et al. (2001) state that Augmented Reality is a system identified by three characteristics; it combines the real and the virtual, it is interactive in real time and it is registered in 3D. Others argue that AR is not just a technology. Besides, it is a field of research, a vision of future computing, an emerging commercial industry and a new medium for creative expression (Kipper & Rampolla, 2013). Augmented reality has four components that should be offered. These components are real object, display screen, data and connection and software (Uluyol & Sahin, 2016).

2.2 Augmented Reality and Language Learning

AR technology has emerged during the latest few years in the field of English language learning. "The influence of constructivist theory is evident in the AR enhanced learning environments" (Wasko & Polytechnic, 2013, p. 18). From the constructivist theory perspective, AR emphasizes the importance of the involvement of the learner actively in the learning process. Unique sights, sounds and movements available in AR provide authenticity and connections between the experience and the real world (Klopfer, 2008). AR technology gives students the chance to construct new knowledge through the interaction with Augmented Reality objects. Boettcher (2007, p. 6) states that "the more dynamic and interactive the learning experience, the more likely students will invest greater amounts of time in the learning process". There are several key implications for mobile learning, specially AR, in English language learning:

1) Presenting material at the level, or just beyond the level, of the learners current ability.

2) Creating authentic task based learning.

3) Scaffolding interaction with others.

4) Connecting with learner's existing knowledge schemas.

5) Presenting both visual and verbal information in tandem.

6) Allowing learners the choice of modality.

7) Giving learners advance preparation (Joseph, 2009, p. 16).

With regard to the current research on AR technology and English language learning, few studies attempted to explore the effect of AR on English language learning. Hsieh, Kuo and Lin (2014) examined the effect of employing AR interactive approach on students' English preposition learning performance. A mobile Augmented Reality English Learning App (MARELA) was developed to examine students' learning motivation and acceptance of MARELA after experiment. The results indicated the students highly recognized the ease-of-use and usefulness of the mobile AR English learning app. The Augmented Reality English learning was novel and interesting for students learning. Rahimi and Miri (2014) investigated the impact of mobile dictionary use on language learning. Thirty-four lower-intermediate language learners participated in a pretest-posttest quasi-experimental study. The result showed that, while controlling for the entry level language ability, the experimental group outperformed the control group in the post-test. The finding of the study underscored the vital role mobile phones play in extending learning out of the classroom anywhere anytime. Later, Chen and Wang (2015) investigated the effects of learning styles and prior English proficiency (high/low) in a mobile Augmented Reality (AR) facilitated English vocabulary learning. An experiment was done with self-developed AR-facilitated instruction. The results indicated that that field dependent learners benefitted significantly better from the mobile AR instruction on learning outcome; there was a marginal significant difference between high and low English proficiency learners on learning outcome. In vocabulary, Solak and Cakır (2015) explored the effect of materials designed with Augmented Reality on language learners' vocabulary learning. 130 undergraduate students from a state-run university in Turkey participated in this study. The results of this study suggested that AR technology materials had positive impact on increasing undergraduate students' motivation towards vocabulary learning in language classroom. This study also signified that a positive significant correlation was found between academic achievement and the motivation in the use of AR technology in language classroom. Furthermore, Zainuddin and Idrus (2016) conducted a study to describe the development process of an Augmented Reality (AR) enhanced flashcards for non-native students of Universiti Sains Islam Malaysia (USIM) to enhance their knowledge and memorization of basic Arabic vocabulary. An application namely Aurasma was used in the development process. This study was conducted with 20 elementary-level students in USIM. Findings indicated that AR enhanced flashcards helped in scaffolding the knowledge of students regarding the Arabic vocabulary acquisition. Also, Ogawa (2016) conducted an action research project to evaluate the use of Aurasma to increase students engagement and retention of vocabulary of a unit on technology and how it changed society for second grade ELL students at an elementary school on Oahu. The students had the opportunity to view Aurasma, video clips and images that were overlaid onto their science textbooks and vocabulary flash cards, previously made. The findings showed that Augmented Reality could affect understanding and engagement with students. Finally, Richardson (2016) explored the extent to which Augmented Reality games enhance

the language learning experience of advanced level EFL learners. The findings affirmed the potential of Augmented Reality games to engage and challenge advanced level language learners.

The above-mentioned research concentrated mainly on teaching vocabulary since vocabulary Augmented Reality applications are easy to be designed, and vocabulary are taught best through real objects whether using traditional teaching methods or technology-based applications. It is obvious that using Augmented Reality enhances language learning and has positive effect on students' performance. Starting from this conclusion, this research tries to bridge the gap that arises from the limited studies that attempt to use Augmented Reality in teaching reading comprehension.

2.3 Lerner Self-Efficacy and AR Technology

Self-efficacy is considered one of the most important factors that affect language learning. It is defined as "one's judgment of how well one can execute courses of action required to deal with prospective situations" (Arnold, 2013, p. 31). It is also defined as "the measure of one's own ability to complete tasks and reach goals or the belief in one's capabilities to achieve a goal or an outcome" (Hussein et al., 2014, p. 97). Self-efficacy involves making a judgment about one's capabilities to perform his/her personal qualifications, such as appearance or characteristics. Students determine whether they can accomplish a task or not (White, 2008). The studies concerning self-efficacy in language learning using AR technology are rare. Chang, Chen, Huang and Huang (2011) investigated learners' satisfaction and behavioral intention as well as the effectiveness of the AR-learning system. The results indicated that perceived self-efficacy affected perceived satisfaction and perceived usefulness. Miyosawa, Akahane, Hara and Shinohara (2012) developed an AR application based on the same content as conventional printed teaching material focusing on the field of foreign language study. The learning efficacy of the two media was assessed by comparing verification test results and monitoring brain activity during the learning process. The results showed that there eas no significant difference in test results between the two media.

2.4 Learner Autonomy in AR Environments

Learner autonomy is defined as the "the natural tendency for learners to take control over their learning" (Benson, 2001). It is "based on the principle that learners should take maximum responsibility for, and control their own learning styles and stages outside the constraints of the traditional classroom" (McDonough, 1998, p. 25). Learner autonomy has become an assumed goal of language learning in many parts of the world. The relationship between CALL research and autonomy has become both more complex and more promising (Reinders & White, 2016). Technology can play a vital role in the development of learners autonomy through helping them develop their knowledge and the necessary learning skills (Reinders & Hubbard, 2013). Autonomy is developed through "a social environment that supports learners' sense of autonomy and intrinsic motivation to purse optimal challenges through the zone of proximal development" (Ushioda, 2007, p. 15). The studies which were conducted regarding how AR promotes autonomy are limited. One of them is the study of Chik (2014) which investigated L2 gaming and learning practices in young people's everyday lives. The study used

a multiple case study approach to examine how Chinese-speaking gamers managed their digital gameplay for L2 learning, and to explore their everyday practices of digital gaming and L2 learning. The finding suggested that L2 gaming activities mediated autonomous learning.

2.5 Lerner Attitudes towards AR Technology

Augmented Reality is one of the emerged and innovative technology that has shifted learning to be more interactive and enjoyable. Students' attitudes towards this kind of learning are very important. An attitude is defined as "a union or synthesis of thoughts and feelings that directs behaviors, reactions, or responses. Attitude is more than thinking. Attitude is more than feeling" (FitzMaurice, 2011, p. 36). Concerning the effect of AR on students' attitudes, Ghasemi and Javidan (2014) presented a model for development of Augmented Reality in English training for children. In this model, children without any filled back pack, and facilities could utilize this technology as a second language only with a smart phone or tablet. The findings indicated that the model had positive impact on students' interest and their attitudes toward the model. In another study, Kuçük, Yılmaz and Göktaş (2014) examined achievement, attitude and cognitive load levels of 122 fifth-grade students (66 males and 56 females) from five different secondary schools in Erzurum in learning English by Augmented Reality. It was found that secondary school students were pleased with learning English by the aid of AR, they had a low anxiety level and they wanted such applications to be used in their courses in future. Another important finding of the study was that the attitudes of successful students were significantly higher than others.

3. Methodology

3.1 Research Design

This research employed the quasi-experimental approach using a pre-post, nonequivalent control group design to explore the effect of Augmented Reality on college students EFL reading comprehension, self-efficacy, autonomy and attitudes towards using AR in learning English language. Two groups were chosen randomly: a control group which was taught using the conventional teaching method and an experimental group which was taught the same content through Augmented Reality technology. A pretest in reading comprehension was administered to both groups to measure students achievement before the treatment. The same test was administered as posttest to both groups at the end of the intervention to explore the differences between the study groups. Two scales; one for self-efficacy and one for autonomy were administered to both group before and after the experiment to measure students' self-efficacy beliefs and their autonomous learning. Finally, an attitude questionnaire was administered to the experiment group only after the treatment to measure students' attitudes after the intervention. Figure 2 demonstrates the design of the study:

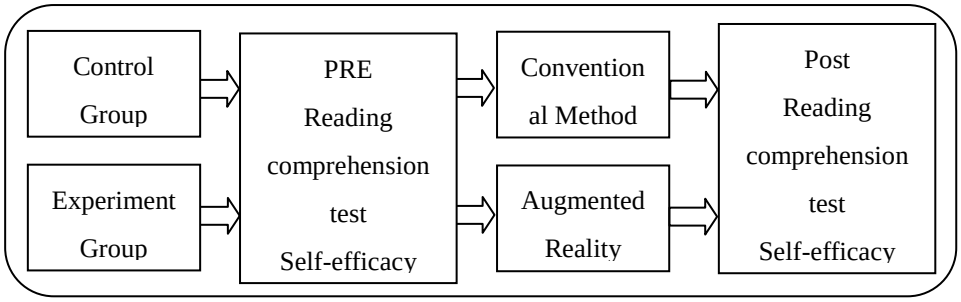

Figure 2. Research Design

3.2 Participants

The total population in this study was (6452) male students studying English For Academic Purposes (Book2) during the second semester of the 2015/2016 academic year at the preparatory year at Taif University, Saudi Arabia. The sample consisted of two groups; the control and the experimental. These two groups were chosen randomly; the control group comprised (29) students whereas the experimental group comprised (30) students.

3.3 Procedure

To achieve the research objective, four units of English for Academic Purposes (Book2) were chosen; Unit(9): Biography, Unit(10): Holidays and Travel, Unit(11): An Important Event and Unit(12): Bigger and Better. These units were chosen specifically because they were suitable for using AR since they contained events and situations that could be transferred to AR. The reading contents of these units were taught to the experimental group through Augment Reality. Two main applications were employed; Polyglocam for translating vocabulary from English into Arabic, and Aurasma App to create Auras that related to the reading topics. Creating these Auras went through these steps:

1. The content of the reading topics was analyzed to choose the appropriate images and videos.
2. These images and videos were used to create Auras.
3. The Auras created were reviewed by specialists in teaching and technology.
4. They were evaluated by experimenting them on few students to test their validity and usability.
5. Some modifications were made to produce the final version.

The experiment lasted eight weeks (4 hours a week). The experimental group taught through using AR technology as follow:

1. The students who did not have smart phones were eliminated from the treatment; there were only three students.
2. A wireless network was provided to make sure that every student could participate.
3. During the first two classes, students were trained on using Polyglocam and Aurasma in reading.
4. Auras were shared with all students.
5. At a reading lesson, students began to preview the lesson and read it silently to answer some pre-reading questions. They used Polyglocam to translated the difficult words as they read.

6. After that, they used their smart phones to see the Aura(s) related to the topic and to write some notes.
7. Then, the reading passage questions were answered.
8. Students were advised to watch the lesson Aura(s) at home to revise each lesson.

3.4 Instruments

Four instruments were employed in this study: a reading comprehension test, a reading comprehension self-efficacy scale, an autonomy scale and attitudes questionnaire.

3.4.1 The Reading Comprehension Test

The reading comprehension test consisted of (20 items) which included literal comprehension (10 items), inferential comprehension (6 items) and evaluative comprehension (4 items). The test had a multiple choice format (one point for each correct answer and zero for each false one). The reliability of the test was calculated (Cronbach's Alpha=0.84.). The test difficulty coefficients ranged from (0.29 to 0.72), and the discrimination coefficients ranged from (0.43 to 0.81).

3.4.2 The Reading Comprehension Self-Efficacy Scale

A number of studies dealing with students self-efficacy were revised (Khajavi & Ketabi, 2012; Piercey, 2013; Yogurtcu, 2013; Boshrabadi & Biria, 2014). A 24-item, five-point-Likert instrument ranging from (strongly disagree to strongly agree) was designed (Appendix A). The validity and reliability of this scale were verified. The reliability was assumed to be .91.

3.4.3 The Autonomy Scale

To asses students' autonomy, a 20-item, five-point-Likert instrument was built. The scale was designed after the revision of some previous research (Zhang & Li, 2004; Macaskill & Taylor, 2010; Hayta & Yaprak, 2013; Mahmoodabadi & Tabatabaei, 2015; Zarei, A. & Zarei, N. 2015). Each item ranged from (strongly disagree (1) to strongly agree (5)). The scale reliability was examined using Cronbach's Alpha and it was .90 (Appendix B).

3.4.4 The Attitudes Questionnaire

Research related to attitudes towards using technology in teaching was revised to build the attitudes questionnaire (Connolly, Stansfield, & Hainey, 2011; Alqurashi, Almoslamani, & Alqahtani, 2015; Huang & Hew, 2016). A 17-item, 5-point Likert questionnaire ranged from strongly disagree (1 point) to strongly agree (5 points) was developed. The scale validity was verified through distributing it to a number of specialists in instruction and measurement. The reliability of the scale was calculated using Cronbach's Alpha; it was (0.93, n=30) suggesting that the scale was reliable (Appendix C).

3.5 Data Collection Procedure

The reading comprehension test was administered before and after the experiment to both groups. The time allotted was 40 minutes considering 2 minutes for each item. In addition, the reading comprehension self-efficacy scale was administered to the experimental group only before and after the treatment to explore the difference between the pre and post applications. The scale had 24 items and students had to choose one of these responses (strongly agree, agree, neutral, disagree and strongly

disagree).

Besides, the autonomy scale was administered to the experimental group only before and after the treatment to explore the difference between the pre and post applications. The scale had 20 items and students had to choose one of these responses (strongly agree, agree, neutral, disagree and strongly disagree).

On the other hand, the attitudes questionnaire was administered to the experimental group after the treatment only to calculate students' attitudes towards AR in learning English language. The questionnaire had 17 items and students had to choose one of these responses (strongly agree, agree, neutral, disagree and strongly disagree). The degree of attitudes was calculated as follows: from (1 to less than 1.8) very low, (1.8 to less than 2.6) low, (2.6 to less than 3.4) moderate, (3.4 to less than 4.2) high, and (4.2 to 5) very high.

4. Results

To test the first hypothesis; "Augmented Reality can improve students' reading comprehension", Table 1 shows the mean scores of both control and experimental groups' post reading comprehension test. The experimental group had higher mean score (m=7.79) in comparison to the control group (m=12.30).

Table 1. Descriptive Statistics of Control and Experimental Groups Post Test

Group	N	Mean	SD
Control	29	7.79	2.66
Experimental	30	12.30	4.79
Total	59	10.08	4.48

To test whether the difference was statistically significant between the two groups, one-way analysis of covariance (ANCOVA) was conducted. The pre test scores were used as the covariate variable.

Table 2. ANCOVA Results of the Pre and Post Reading Comprehension Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	421.227	2	210.614	15.867	.000	.362
Intercept	268.583	1	268.583	20.234	.000	.265
Pre test	121.709	1	121.709	9.169	.004	.141
Group	316.627	1	316.627	23.853	.000	.299
Error	743.349	56	13.274			
Total	7165.000	59				
Corrected Total	1164.576	58				

Table 2 shows the result of ANCOVA which revealed that there was a statistically significant difference between the two groups in the reading comprehension post-test (F=23.853; p=.000; partial Eta squared=0.299) in favor of the experimental group. Consequently, using Augmented Reality technology improved students' reading comprehension comparing to the traditional teaching method.

To test the second hypothesis; "Augmented Reality can improve students' reading comprehension self-efficacy", the paired-samples T Test was used to compare the date obtained from the pre and post administrations of the self-efficacy scale to the experimental group. Table 3 shows the result of this test:

Table 3. The Difference between Pre and Post Administrations of the Self-Efficacy Scale

Variable	Treatment	N	Mean	Std. Deviation	t	df	Sig.	Effect size
Self-efficacy	Pre	30	2.95	.85	2.754	29	.01	.21
	Post	30	3.25	.66				

As seen in Table 3, there was a statistically significant difference between the mean scores of the pre and post administration of the self-efficacy scale in favor of the post administration (Pre: M=2.95; SD=.85; Post: M=3.26; SD=.66; t=2.754; Sig.<.01; effect size=0.21), which meant that using Augmented Reality in teaching was effective in improving students' reading comprehension self-efficacy.

To test the third hypothesis; "Augmented Reality can improve students' autonomy", the paired-samples T Test was conducted to compare the date obtained from the pre and post administrations of the autonomy scale to the experimental group. Table 4 shows the result of this test:

Table 4. The Difference between Pre and Post Administrations of the Autonomy Scale

Variable	Treatment	N	Mean	Std. Deviation	t	df	Sig.	Effect size
Autonomy	Pre	30	2.92	.68	2.655	29	.01	.20
	Post	30	3.26	.76				

As seen in Table 4, there was a statistically significant difference between the mean scores of the pre and post administration of the autonomy scale in favor of the post administration (Pre: M=2.92; SD=.68; Post: M=3.27; SD=.76; t=2.655; Sig.<.01; effect size=0.20), which indicated that using Augmented Reality in teaching was effective in improving students' autonomy.

To test the fourth hypothesis; "Students will have positive attitudes towards using Augmented Reality in language learning", means and standard deviations of students' attitudes were calculated and arranged in descending. One-sample T Test was used to determine the significance of the AR on students' attitudes (Test Value=3) The results are shown in Table 5:

Table 5. The Mean Scores, Standard Deviation and One-Sample T Test of the Attitudes Scale

No	Items	Mean	Std. Deviation	t	df	Sig.
1	I believe AR could be used in the foreign language domain in the future.	4.13	.81	7.577	29	.000
2	Using AR helps me to release tension.	4.10	.80	7.503	29	.000
3	Using AR is exciting.	4.03	.92	6.100	29	.000
4	Using AR helps to stop me from being bored.	3.97	.85	6.227	29	.000
5	The variety of reading passages, exercises, illustrations, etc., helped keep my attention on the lesson.	3.97	.88	5.950	29	.000
6	Using AR is enjoyable.	3.93	.82	6.176	29	.000
7	AR motivated me to use a foreign language.	3.93	.82	6.176	29	.000
8	Using AR is a worthwhile activity.	3.90	.88	5.572	29	.000
9	Using AR gives me a challenge.	3.87	.93	5.066	29	.000
10	These materials presented using AR are eye-catching.	3.83	.79	5.767	29	.000
11	I learned some things that were surprising or unexpected.	3.80	.84	5.174	29	.000
12	I enjoyed learning a foreign language using AR.	3.80	.92	4.738	29	.000
13	Using AR gives me pleasure.	3.77	.97	4.323	29	.000
14	Using AR helps me to develop useful skills.	3.70	.79	4.826	29	.000
15	Using AR has things that stimulated my curiosity.	3.60	.85	3.844	29	.001
16	Using AR gives me a sense of control.	3.57	.97	3.195	29	.003
17	Using AR allows me to enter a fantasy world.	3.57	.99	2.984	29	.006
Overall Mean		3.85	061	7.558	29	.000

As seen in Table 5, the overall mean score of students' attitudes towards using Augmented Reality in language learning was high (M=3.85; SD=.61). All attitudes items were high, ranging from (3.57 to 4.13). The highest item was "I believe AR could be used in the foreign language domain in the future", (M=4.13; SD=.81) which indicated students' desire to use Augmented Reality in foreign language learning domains. It is followed by "Using AR helps me to release tension", (M=4.10; SD=.80) indicating the usefulness of AR in reducing language learning anxiety. The lowest items were "Using AR gives me a sense of control" and "Using AR allows me to enter a fantasy world", (M=3.57; SD=.97, M=3.57; SD=.99) respectively.

Besides, the results of one-sample T Test showed that all items were statistically significant and the grand mean score was statistically significant (t=7.558; df=29; p=.000), which indicated that students had positive attitudes towards using Augmented Reality in language learning.

To test the fifth hypothesis; "There are significant relationships between students' self-efficacy, autonomy and attitudes", Pearson correlation coefficient was used as shown in Table 6:

Table 6. The Relationships between Self-Efficacy, Autonomy and Attitudes (n=30)

Variables		Self-Efficacy	Autonomy	Attitudes
Self-Efficacy	Pearson Correlation	1		
	Sig.			
Autonomy	Pearson Correlation	.869**	1	
	Sig.	.000		
Attitudes	Pearson Correlation	.509**	.433*	1
	Sig.	.004	.017	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 6 showed that there was a high positive statistically significant relationship between students' self-efficacy and students' autonomy (r=.869; p=.000). Moreover, there was a moderate positive statistically significant relationship between students' self-efficacy and their attitudes towards AR (r=.509; p=.004). Finally, there was a moderate positive statistically significant relationship between students' autonomy and their attitudes towards AR (r=.433; p=.017). These findings indicated positive significant relationships between students' self-efficacy, autonomy and attitudes, so the hypothesis 5 is accepted.

5. Discussion

Regarding the first hypothesis, the findings showed that using Augmented Reality technology improved students' reading comprehension skills comparing to the traditional teaching method. This improvement is due to the potentials that AR can offer to learners. Students had opportunities to have continuous connection to the English language inside and outside the classroom. Using the dictionary app saved students time through getting immediate translation instead of asking the instructor or using printed dictionaries. Besides, the visual and audio multimedia available in AR supported students learning and made learning meaningful. Generally, these findings confirm previous research findings that indicated the usefulness and effectiveness of using AR in language learning (Hsieh et al., 2014; Rahimi & Miri, 2014; Chen & Wang; 2015; Solak & Cakır, 2015; Zainuddin & Idrus, 2016; Ogawa, 2016; Richardson, 2016).

Concerning students' reading comprehension self-efficacy, the findings also indicated that using Augmented Reality in teaching was effective in improving students' reading comprehension

self-efficacy. Students were able to define the parts that they did not understand from the text, and repeat the learning process using AR to understand what seemed difficult for them. Besides, AR enabled students to read without the guidance of their teachers to gain more confidence and self-learning and used their reading time wisely and efficiently since the activities were arranged in a step-by-step way. Moreover, grasping the meaning of text-related images, tables or graphics that AR provided, encouraged students to be more efficacious.

Regarding students' autonomy, the finding revealed that using Augmented Reality in teaching improved students' autonomy. Students became autonomous learners in AR environments through using their free time to study, managing their time and previewing the reading tasks before the class. AR learning environments enabled students to practice reading comprehension alone, find information about new topics on their own and take responsibility of their learning experiences. Moreover, students had the chance to use reading resources willingly, try new things to practice reading, and use internet and computers to study and improve their reading. This finding agrees with the findings of Chik (2014) which revealed that using smart phones technology mediated learning autonomously.

On the other hand, AR technology had positive impact on students' attitudes towards using Augmented Reality in language learning. Students believed that AR could be used in the foreign language domain in the future. It was useful in releasing tension, enjoyable, challenging, exciting and stopped them from being bored. AR materials helped students to keep attention on the lesson, develop useful skills, motivate them and stimulate their curiosity. This finding goes in consistence with previous research findings. AR had positive impact on students' interest and their attitudes toward using AR in language learning (Ghasemi & Javidan, 2014). In addition, students were pleased with learning English through using AR; they had a low anxiety level and they wanted such applications to be used in their courses in future (Ku çük et al., 2014).

Additionally, findings indicated positive significant relationships between students' self-efficacy, autonomy and attitudes. A high positive relationship was shown between reading comprehension self-efficacy and autonomy. This indicated that students with high reading comprehension self-efficacy were more autonomous than other students. This might be due to the fact that when students depend on themselves in learning a language, they become self-efficacious and do more tasks independently and confidently. The moderate positive relationship between reading comprehension self-efficacy and attitudes towards AR might arise from students' satisfaction of using AR so this status increased their self-efficacy since AR enabled students to maintain their learning process and gave them a chance to do reading tasks easily. Moreover, a moderate positive relationship was seen between autonomy and attitudes towards using AR. This relationship might be interpreted to the fact that students' positive attitudes towards AR created opportunities for students to use AR independently and enhanced their centeredness.

6. Conclusion and Implications

This research presented an Augmented Reality learning environment using Polyglocam and Aurasma applications. The research aimed at investigating the effect of AR on students' reading comprehension, reading comprehension self-efficacy, autonomy and attitudes towards using AR in language learning. The findings showed that AR had a positive impact on reading comprehension, self-efficacy, autonomy and attitudes. Also, there were positive statistically significant relationships between self-efficacy, autonomy and attitudes. The positive impact of AR in English language teaching/learning comes from its potentials in offering real-life situations, dynamic interaction, visual and auditory objects and any-time learning resources. The strengths of this research appear in using AR in teaching reading comprehension; this is the first research, to the best knowledge of the researcher, that deals with reading comprehension at college level. Besides, it deals with variables affected by AR, i.e., self-efficacy, autonomy and attitudes. This study will give a chance to coming research to strengthen the role of AR technologies not only in language learning but also in other learning fields. Findings of this study may improve teachers' practice and experiences in AR learning environments as well as their abilities to design and implement AR applications. Moreover, findings will expand our understanding of the factors that facilitate language instruction in the digital era.

According to the current research findings, it is recommended that effective digital learning environments should be part of schools and universities in the near future to more success of AR implementation in language learning. Besides, teachers should be trained and motivated to integrate AR technology in language teaching and on how to choose appropriate contents, effective tasks and suitable assessment strategies before selecting AR tools and applications. Teachers should also evaluate AR technology use continuously to have correct decisions regarding enhancement, modification or dispensing. Moreover, language textbooks should be provided with AR applications to give a chance to students to study autonomously. Further research should shed light on applying AR to other language skills such as writing, grammar, speaking and listening since these skills are not given adequate attention until now. Also, students' behaviors, attitudes, aptitudes should be given more interest to activate students' participation in AR environments in different fields of language learning.

Considering the findings of the current study, teachers should be aware of students' self-efficacy and autonomy. They have to strengthen students' confidence as independent learners. Also, teachers should give priority to students' autonomy since autonomous learning is one of the most important features of learning in the technology era.

References

Al-Nooh, A., & Mosson-McPherson, M. (2013). The effectiveness of reading techniques used in a Saudi Arabian secondary school classroom as perceived by students and teachers: A study of methods used in teaching English and their effectiveness. *Arab World English Journal*, *4*(3), 331-345.

Al-Qahtani, A. (2016). Why Do Saudi EFL Readers Exhibit Poor Reading Abilities? *English Language and Literature Studies*, *6*(1), 1-15. https://dx.doi.org/10.5539/ells.v6n1p1

Alqurashi, M., Almoslamani, Y., & Alqahtani, A. (2015). Middle School Students' Digital Game Experiences in the city of Makkah in Saudi Arabia. *Proceedings of SOCIOINT15-2nd International Conference on Education, Social Sciences and Humanities* (pp. 305-313).

Arnold, J. (2013). Self issues and motivated behavior in language learning. In J. Arnold, & T. Murphey (Eds.), *Meaningful Action: Earl Stevick's Influence on Language Teaching* (pp. 29-44). Cambridge: Cambridge University Press.

Azuma, R., Baillot, Y., Behringer, R., Feiner, S., Julier, S., & MacIntyre, B. (2001). Recent advances in augmented reality. *IEEE Computer Graphics and Applications*, *21*(6), 34-47. https://dx.doi.org/10.1109/38.963459

Banks, T. (2008). *Foreign Language Learning Difficulties and Teaching Strategies* (Master thesis). School of Education, Dominican University of California, San Rafael, CA.

Benson, P. (2001). *Research in Autonomy*. London: Longman.

Boettcher, J. V. (2007). Ten Core Principles for Designing Effective Learning Environments: Insights from Brain Research and Pedagogical Theory. *Innovate: Journal of Online Education*, *3*(3).

Boshrabadi, A., & Biria, R. (2014). The Efficacy of Multimodal vs. Print-Based Texts for Teaching Reading Comprehension Skills to Iranian High School Third Graders. *International Journal of Language Learning and Applied Linguistics World*, *5*(1), 365-380.

Chang, Y., Chen, C., Huang, W., & Huang, W. (2011, July 11-15). *Investigating students' perceived satisfaction, behavioral intention, and effectiveness of English learning using augmented reality*. Paper presented to the International Conference on Multimedia and Expo (ICME).

Chen, C., & Wang, C. (2015, December 14-16). *The Effects of Learning Style on Mobile Augmented-Reality-Facilitated English Vocabulary Learning*. Paper presented at Information Science and Security (ICISS). https://dx.doi.org/10.1109/icissec.2015.7371036

Chik, A. (2014). Digital gaming and language learning: Autonomy and community. *Language Learning & Technology*, *18*(2), 85-100.

Connolly, T., Stansfield, M., & Hainey, T. (2011). An alternate reality game for language learning: ARGuing for multilingual motivation. *Computers & Education*, *57*, 1389-1415. https://dx.doi.org/10.1016/j.compedu.2011.01.009

Craig, A. (2013). *Understanding Augmented Reality: Concepts and Applications*. Waltham, MA: Elsevier Inc.

Darmi, R., & Albion, P. (2014). *A review of integrating mobile phones for language learning*. Paper presented to the 10th International Conference on Mobile Learning, 28 Feb-2 Mar, Madrid, Spain.

FitzMaurice, K. (2011). *Attitude Is All You Need* (2nd ed.). Omaha: FitzMaurice Publishers.

Ghasemi, A., & Javidan, R. (2014). A New Model as English Tutorial Assistant based on Augmented Reality. *Journal of Educational and Management Studies*, *4*(3), 695-701.

Gilgen, R. (2005). Holding the world in your hand: Creating a mobile language learning environment. *Educause Quarterly*, *28*(3), 30-39.

Grabe, W., & Stoller, F. (2013). *Teaching and Researching Reading* (2nd ed.). New York: Routledge.

Graesser, A. (2007). An Introduction to Strategic Reading Comprehension. In D. Mcnamara (Ed.), *Reading Comprehension Strategies: Theories, Interventions, and Technologies* (pp. 3-26). New Jersey: Lawrence Erlbaum Associates, Inc.

Hayta, F., & Yaprak, Z. (2013). Learner Autonomy and Computer Technology as a Facilitator of Autonomous Language Learning. *Journal of Educational and Instructional Studies in the World*, *3*(2), 57-63.

Hsieh, M., Kuo, F., & Lin, H. (2014). The effect of employing AR interactive approach on students' English preposition learning performance. *Journal of Computers and Applied Science Education*, *1*(1), 45-60.

Huang, B., & Hew, K. (2016). Measuring Learners' Motivation Level in Massive Open Online Courses. *International Journal of Information and Education technology*, *6*(10), 759-764. https://dx.doi.org/10.7763/IJIET.2016.V6.788

Hussein, B., Hage-flab, A., Hammond, M., Kawtharani, A., El-Hage, H., & Ilaj-Ali, A. (2014). Management Response to Improve the Educational Performance of Engineering Students: The Case of the Lebanese International University. In G. Khoury, & M. Khoury (Eds.), *Cases on Management and Organizational Behavior in an Arab Context* (pp. 91-111). Hershey: Business Science Reference. https://dx.doi.org/10.4018/978-1-4666-5067-1.ch006

Iqbal, M., Noor, M., Muhabat, F., & Kazemian, B. (2015). Factors Responsible for Poor English Reading Comprehension at Secondary Level. *Communication and Linguistics Studies*, *1*(1), 1-6. https://dx.doi.org/10.2139/ssrn.2602630

Joseph, S. (2009). Mobile Devices for Language Learning: Multimedia Approaches. *Research and Practice in Technology Enhanced Learning*, *4*(1), 7-32. https://dx.doi.org/10.1142/S179320680900060X

Khajavi, Y., & Ketabi, S. (2012). Influencing EFL Learners' Reading Comprehension and Self-efficacy Beliefs: The Effect of Concept Mapping Strategy. *Porta Linguarum*, *17*, 19-27.

Kipper, G., & Rampolla, J. (2013). *Augmented Reality: An Emerging Technologies Guide to AR*. Waltham, MA: Elsevier. https://dx.doi.org/10.1016/b978-1-59-749733-6.00001-2

Klingner, J., Vaughn, S., & Boardman, A. (2015). *Teaching Reading Comprehension to Students with Learning Difficulties* (2nd ed.). New York: The Guilford Press.

Klopfer, E. (2008). *Augmented learning: Research and design of mobile educational games* (Master thesis). Cambridge: MIT Press. https://dx.doi.org/10.7551/mitpress/9780262113151.001.0001

Koch, J. (2016). *TEACH3: Introduction to Education*. Boston, MA: Cengage Learning.

Kuçük, S., Yılmaz, R. M., & Göktaş, Y. (2014). Augmented Reality for Learning English: Achievement, Attitude and Cognitive Load Levels of Students. *Education and Science*, *39*(176), 393-404. https://dx.doi.org/10.15390/eb.2014.3595

Liu, T., Tan, T., & Chu, Y. (2010). QR Code and Augmented Reality-Supported Mobile English Learning System. In X. Jiang, M. Ma, & C. Chen (Eds.), *Mobile Multimedia Processing: Fundamentals, Methods, and Applications* (pp. 37-52). Berlin: Springer. https://dx.doi.org/10.1007/978-3-642-12349-8_3

Macaskill, A., & Taylor, E. (2010). The development of a brief measure of learner autonomy in university students. *Studies in Higher Education*, *35*(3), 351-359. https://dx.doi.org/10.1080/03075070903502703

Mahmoodabadi, M., & Tabatabaei, M. (2015). The Relationship between Motivation and Autonomy in Iranian Intermediate EFL Learners. *International Journal of Educational Investigations*, *2*(1), 58-79.

Marzban, A. (2011). Improvement of reading comprehension through computer-assisted language learning in Iranian intermediate EFL students. *Procedia Computer Science*, *3*, 3-10. https://dx.doi.org/10.1016/j.procs.2010.12.003

McDonough, J. (1998). Autonomous Learning. In K. Johnson, & H. Johnson (Eds.), *Encyclopaedic dictionary of applied linguistics* (p. 25). Oxford: Blackwell.

McMahon, D. (2014). *Augmented Reality on Mobile Devices to Improve the Academic Achievement and Independence of Students with Disabilities* (Doctoral Dissertation). University of Tennessee, Knoxville.

Miangah, T., & Nezarat, A. (2012). Mobile-Assisted Language Learning. *International Journal of Distributed and Parallel Systems (IJDPS)*, *3*(1), 309-319. https://dx.doi.org/10.5121/ijdps.2012.3126

Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. *1E-ICE Transactions on Information Systems*, *77*(12).

Miyosawa, T., Akahane, M., Hara, K., & Shinohara, K. (2012, July). Applying Augmented Reality to E-Learning for Foreign Language Study and its Evaluation. In H. Arabnia, A. Bahrami, J. Cabiria, & M. Neal (Eds.), *EEE 2012* (pp. 310-316). Paper presented at the Proceedings of the 2012 International Conference on E-Learning, E-Business, Enterprise Information Systems, & E-Government. Las Vegas Nevada: CSREA Press.

Mora-Flores, E. (2011). *Connecting Content and Language for English Language Learner*. CA: Shell Educational Publishing Inc.

Mullen, T. (2011). *Prototyping Augmented Reality*. Indiana: John Wiley & Sons Inc.

Nezami, S. (2012). A critical study of comprehension strategies and general problems in reading skill faced by Arab EFL learners with special reference to Najran University in Saudi Arabia. *International Journal of Social Sciences and Education*, *2*(3), 306-316.

Ogawa, T. (2016). *Vocabul-AR-y: Action Research Project of Aurasma to Support Vocabulary* (Master Thesis). University of Hawaii, Honolulu, HI, USA.

Perfetti, C., Landi, N., & Oakhil, J. (2005). The Acquisition of Reading Comprehension Skill. In M. Snowling, & C. Hulme (Eds.), *The Science of Reading: A Handbook* (pp. 227-247). Malden, MA: Blackwell Publishing. https://dx.doi.org/10.1002/9780470757642.ch13

Piasecka, L., Adams-Tukiendorf, M., & Wilk, P. (Eds.). (2015). *New Media and Perennial Problems in Foreign Language Learning and Teaching*. Switzerland: Springer International Publishing.

Piercey, R. (2013). *Reading Self-Efficacy in Early Adolescence: Which Measure Works Best* (Doctoral thesis)? College of Education at the University of Kentucky, USA.

Rahimi, M., & Miri, S. (2014). The Impact of Mobile Dictionary Use on Language Learning. *Procedia-Social and Behavioral Sciences*, *98*, 1469-1474. https://dx.doi.org/10.1016/j.sbspro.2014.03.567

Reinders, H., & Hubbard, P. (2013). CALL and learner autonomy: Affordances and constraints. In M. Thomas, H. Reinders, & M. Warschauer (Eds.), *Contemporary Computer-Assisted Language Learning* (pp. 359-376). London: Bloomsbury Academic.

Reinders, H., & White, C. (2016). 20 years of autonomy and technology: How far have we come and where to next? *Language Learning & Technology*, *20*(2), 143-154.

Richardson, D. (2016). Exploring the Potential of a Location Based Augmented Reality Game for Language Learning. *International Journal of Game-Based Learning (IJGBL)*, *6*(3), 34-49. https://dx.doi.org/10.4018/IJGBL.2016070103

Shore, J., & Sabatini, J. (2009). *English Language Learners with Reading Disabilities: A Review of the Literature and the Foundation for a Research Agenda*. Princeton: Educational Testing Service.

Solak, E., & Cakır, R. (2015). Exploring the effect of materials designed with augmented reality on language learners' vocabulary learning. *The Journal of Educators Online-JEO*, *13*(2), 50-72. https://dx.doi.org/10.9743/jeo.2015.2.5

Uluyol, C., & Sahin, S. (2016). Augmented Reality: A New Direction in Education. In D. Choi, A. Dailey-Hebert, & J. Estes (Eds.), *Emerging Tools and Applications of Virtual Reality in Education* (pp. 239-257). Hershey: Information Science Reference. https://dx.doi.org/10.4018/978-1-4666-9837-6.ch011

Ushioda, E. (2007). Motivation, autonomy and sociocultural theory. In P. Benson (Ed.), *Learner autonomy 8: Teacher and learner perspectives* (pp. 5-24). Dublin, Ireland: Authentik.

Viberg, O., & Gronlund, A. (2012). *Mobile Assisted Language Learning: A literature review*. Paper presented to the 11th International Conference on Mobile and Contextual Learning, Helsinki, Finland.

Wasko, C., & Polytechnic, V. (2013). What teachers need to know about augmented reality enhanced learning environments. *TechTrends, 57*(4), 17-21. https://dx.doi.org/10.1007/s11528-013-0672-y

White, A. (2008). *The Relationship among Race, Gender, and High School Students' Self-efficacy in English language arts*. Doctoral Dissertation, Fordham University, U.S.A.

Yogurtcu, K. (2013). The impact of self-efficacy perception on reading comprehension on academic achievement. *Procedia-Social and Behavioral Sciences, 70*, 375-386. https://dx.doi.org/10.1016/j.sbspro.2013.01.075

Zainuddin, N., & Idrus, R. (2016, April 10-11). *The use of augmented reality enhanced flashcards for Arabic vocabulary acquisition*. Paper presented to the 13th Learning and Technology Conference (L&T).

Zarei, A., & Zarei, N. (2015). On the effect of Language Proficiency on Learners' Autonomy and Motivation. *Journal of English Language and Literature, 3*(2), 263-270. https://dx.doi.org/10.17722/jell.v3i2.97

Zhang, L., & Li, X. (2004). A comparative study on learner autonomy between Chinese students and west European students. *Foreign Language World, 4*, 15-23.

Appendix A

Reading Comprehension Self-Efficacy Scale

Pre ( ) Post ( )

No.	Statements	SD	D	N	A	SA
1	I can define the parts that I didn't understand from the text.					
2	I understand any text.					
3	I can grasp the main topic of the reading text in text related images.					
4	I get high marks on reading comprehension.					
5	I can read without the guidance of my teachers.					
6	I can determine main and supporting ideas of texts.					
7	I can explain and summarize after reading.					
8	I can complete the reading although the text is boring.					
9	I can ask questions after reading.					
10	I use my reading time wisely/efficiently.					
11	I can summarize the text I read.					
12	I can take notes while I am reading.					
13	I can grasp the meaning of text-related images, table or graphics.					
14	I feel good while I am reading.					

15	I can break big words into smaller parts (prefixes and suffixes).					
16	I can figure out the meaning of an unknown word in a sentence.					
17	I can skim a passage for important information.					
18	I sound like a good reader when reading out loud.					
19	I can understand what I am reading when I read to myself.					
20	My reading teachers have told me that I am good at reading.					
21	Other students have told me that I'm good in reading.					
22	I do well on reading assignments.					
23	I got a good grade in reading on my last report card.					
24	When I see how my reading teacher reads, I can see myself reading in the same way.					

Appendix B

Autonomy Scale

Pre ( ) Post ( )

No.	statements	SD	D	N	A	SA
1	I think I have the ability to learn reading well.					
2	I make good use of my free time in English study.					
3	My time management is good.					
4	I preview the reading before the class.					
5	I find I can finish my reading task in time.					
6	I keep a record of my study, such as keeping a diary, writing review, taking note, etc.					
7	I attend out-class activities to practice and learn reading.					
8	I use reading resources willingly.					
9	I like reading activities I can learn on my own.					
10	I have the ability to learn reading alone.					
11	I like trying new things to practice reading.					
12	I learn reading better when studying alone.					
13	I note my strengths and weaknesses in reading and improve them.					
14	I enjoy new learning experiences.					
15	I enjoy finding information about new topics on my own.					
16	I take responsibility for my learning experiences.					
17	I am happy working on my own.					

18	I make decisions and set goals of my learning.					
19	Besides the contents prescribed in the course, I read extra materials In advance.					
20	I use internet and computers to study and improve my reading.					

Appendix C

Attitudes Questionnaire

No.	statements	SD	D	N	A	SA
1	These materials presented using AR are eye-catching.					
2	Using AR has things that stimulated my curiosity.					
3	I learned some things that were surprising or unexpected.					
4	The variety of reading passages, exercises, illustrations, etc., helped keep my attention on the lesson					
5	Using AR gives me a challenge.					
6	Using AR gives me a sense of control.					
7	Using AR allows me to enter a fantasy world.					
8	Using AR gives me pleasure.					
9	Using AR helps to stop me from being bored.					
10	Using AR helps me to release tension.					
11	Using AR helps me to develop useful skills.					
12	Using AR is a worthwhile activity.					
13	Using AR is exciting.					
14	Using AR is enjoyable.					
15	I enjoyed learning a foreign language using AR.					
16	AR motivated me to use a foreign language.					
17	I believe AR could be used in the foreign language domain in the future.					