Using Augmented Reality in Language Classrooms: The Case of EFL Elementary Students

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ARTICLE INFO

ABSTRACT

This study sought to measure the effect of using augmented reality (AR) on developing language learning. It also explored teachers' perceptions about the use of augmented reality in general, and its effect on students' autonomy. A quasi-experimental research design using a pre-test and a post-test with control and experimental groups was followed to measure the effect of using augmented reality on elementary students' language learning. Further, two questionnaires were designed to explore EFL teachers' perceptions about AR, and its effect on students' autonomy. The sample consisted of 72 Saudi EFL elementary students and 80 EFL teachers. The results revealed that the use of augmented reality enhanced EFL students' language learning significantl . The results also showed that teachers perceived AR technology as valuable and effective. They acknowledged its multiple benefits for EFL elementary students. It enabled better learning of essential skills, increased students' motivation and positive attitudes, and fostered students' autonomy. It is expected that these findings will help learners, teachers, curriculum developers, and administrators.

INTRODUCTION

New technology provides opportunities to improve the practice of learning a language. It can also provide solutions to some of the problems that accompany the learning and teaching of foreign languages, in particular. Nowadays, with the increase of mobile phones and applications, teachers and students can access different educational technologies effortlessl . Such spread of mobile devices has made the delivery, creation, and sharing of instructional content easier (McMahon, 2014). Mobile technologies have also facilitated language learning by providing "an authentic, socially connective, contextually sensitive, and personalized mobile-mediated language learning environment" (Lin & Lin, 2019, p.878).

During the last decades, research focused on the benefits of using Computer-Assisted Language Learning (CALL). Recently, there has been a call for further research on Mobile-Assisted Language Learning (MALL). Different studies and reviews have indicated that there is a lack of research that experimentally shows the role of using mobile technologies in improving the results of language learning. They suggest that more experimental cases are needed for

such practical research to help understand the significance of new technologies in teaching English (Darmi & Albion, 2014; Gutiérrez-Colón et al., 2020; Viberg & Gronlund, 2012). Also, the review of Shadiev et al., 2020 clearly shows the need for more studies on MALL with larger sample sizes and longer interventions. Given the need for research on the effect of using mobile technology, this study focuses on augmented reality (AR) as one of the recent and promising technological innovations that needs further attention. In their seminal report, Freeman et al, (2017) indicated that virtual reality (VR) is one of the most noteworthy technologies that can witness considerable growth in the educational field within three to five years. In fact, augmented reality, as a type of VR, has gained ground in these years due to its ease of access and availability in mobile devices (Redondo et al., 2020).

Augmented reality is a technology that can be integrated in teaching and learning languages. The most common use of AR is to increase visual sensations (Kipper & Rampolla, 2013). Thus, integrating authentic language with English teaching using AR can help to develop language learning and foster English mastery (Webb, 2018). It also allows for student-centered learning that can have a positive impact on

developing students' proficienc and autonomy (Anastass-ova, et al., 2014). In spite of such possible benefits, research on the effect of AR on language learning is still in its infancy. Wen (2021) asserted that AR is commonly used in diffe - ent fields especially in STEM education (science, technol-ogy, engineering, and mathematics); yet AR research in language learning is far from satisfactory. Particularly, there is a need for research on the effect of AR in EFL setting given the insufficien opportunities for language practice. In their state-of-the-art review article, Parmaxi and Demetriou (2020) maintained that the increased potential of AR urges for further studies with differe t instructional designs and user experiences. In fact, considering using AR in teaching EFL elementary students is of particular importance because of the potential it holds for such setting and users. Of equal importance is to explore teachers' perceptions of AR and its effect on students' autonomy. Thus, the purpose of the cur-rent study is to investigate the effect of AR on EFL elemen-tary students. It also seeks to explore teachers' perceptions of AR, and its effect on students' autonomy. The key research questions for the study are:

1) What is the effect of using AR on learning English among EFL elementary students?
2) What are EFL teachers' perceptions regarding the use of AR in elementary schools?
3) How do teachers perceive the effect of AR on EFL ele-mentary students' learning autonomy?

LITERATURE REVIEW

Theoretical Background

Koch (2016) defined agumented reality 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" p. 124). It is the process of integrating digital information with real-world information, digitally and in real-time. For example, through AR, students could point a smartphone at a city street landscape and receive feedback in their native language and English regarding what they are viewing. AR also allows students to build new knowledge through inter-action with real and digital worlds. Boettcher (2007) main-tained that learners become engaged and spend more time in learning if learning tasks are interactive. AR helps students to use their five senses during learning which can enhance language learning experience by making it more interactive and motivating. Thus, it can increase students' engagement while diversifying instruction at the same time. This kind of interaction can help improve students' learning outcomes (Chen & Wang, 2015; Solak & Cakır, 2015; Wen, 2021).

Constructivist theory may underpin the use of AR in English language learning. Wasko (2013) elaborated that constructivist theory is manifested in the use of AR in learn-ing. Constructivists argue that simple knowledge trans-mission is ineffective as learners need to construct their own understanding of the material through experiences, reflections, immersion, and communication with peers and instructors (McComas, 2013). AR promotes learners' involvement in the learning process and can enhance auton-omy. Authenticity and connections between learning and the real world are provided by AR, since it presents the mate-rial with unique sights, sounds, and movements (Klopfer, 2008). According to Perren et al. (2017), AR enables learn-ers to process the new material through their own interpre-tations and experiences. Additionally, it helps them interact with peers through multimedia. Thus, AR allows students to demonstrate enhanced performance.

Research on Augmented Reality

To date, there is limited research in the field of AR tech-nologies and their impact on English language learning. Generally, the use of AR has been studied from different perspectives including its effectiveness on language learn-ing, autonomy, attitudes, motivation, teachers' perceptions, etc. For example, regarding language learning, Solak and Cakır (2015) investigated the influence of materials devel-oped using AR on learning vocabulary. The investigation involved 130 undergraduate students from Turkey. The study confirmed the positive impact of AR technology mate-rials on the motivation of undergraduate students to study vocabulary in language classes. More specificall , the results revealed a significant positive correlation between motiva-tion to use AR technology and academic progress. Similarly, Ogawa (2016) evaluated the use of Aurasma, an AR plat-form, to increase second grade EFL students' vocabulary engagement and retention. Through the Aurasma app, stu-dents viewed videos and pictures, which were superimposed on their textbooks, along with presenting vocabulary flas - cards. The results revealed a positive impact of AR on under-standing and interaction with learners. In addition, Parmaxi and Demetriou (2020) reviewed AR studies from 2014 to 2019. Their systematic review supported the positive effects of using AR in language learning.

Considering motivation and attitude, Taskiran's study (2018) identifi d the positive effects of AR on students' experiences. The researcher used a descriptive survey with students in Turkey whose language classes incorporated a game-based approach. The study revealed that most students enjoyed the augmented learning environment and found it particularly motivating. Along similar lines, Zhang (2018) argued that AR can improve learners' attitudes and enjoy-ment, create contextual awareness, enhance understanding, and offer an authentic learning experience. These findings are consistent with those provided by Yang and Mei (2018), who assessed university students' attitudes towards AR.

In order to implement AR in classrooms, teachers' com-mitment and involvement are needed. It is important to ensure that teachers have positive attitudes towards this technology and have the necessary training to use it in the classroom. Several studies have attempted to explore teachers' percep-tions of AR. Mundy et al. (2019) found that educators were generally satisfied with this technology and found it engag-ing and enjoyable for students. However, they mentioned some challenges including AR cost, lack of availability of equipment, time constraints, and the lack of options. This is consistent with a study by Delello (2014), which showed that

the lack of time and infrastructure might indeed be a barrier to AR use in classrooms. Yet, Delello (2014) maintained that AR may increase teachers' enthusiasm and students' motivation and engagement.

Learner Autonomy and AR

Benson (2001) defined learner autonomy as learner's ability to control his/her learning. Learning autonomy is fundamental in language learning. Autonomous learners are responsible for their learning which ensures learning continuity. Reinders and Hubbard (2013) stressed that technology can be very useful in enhancing students' learning autonomy as it assists them in improving language skills.

Unfortunately, very few studies have explored the effect of AR on students' autonomy, especially in the context of language learning. One of the studies that investigated the connection between AR and autonomy was conducted by Siposova and Hlava (2020) in the context of tertiary education. The researchers analysed the results of 21 studies published in a period from 2013 to 2017 and found that AR implementation indeed helps increase students' autonomy and motivation. In the EFL setting, Alsowat (2016) investigated the effect of using AR on college-level EFL students' reading comprehension, self-effica , autonomy, and attitudes. He found significant differences in post-test scores favouring the experimental group in the different variables. This indicates that using AR in teaching helps to improve students' autonomy.

The above studies indicate that using AR to support learning English as a foreign language holds great potentials. It can improve both teaching and learning as it bridges the gap between the real and virtual worlds. Yet, further studies in different contexts are still needed to confir the effect of AR on language learning. More importantly, there are also gaps in research, particularly in regard to the effects of AR on EFL students' autonomy and teachers' perceptions of AR use in language instruction. This study attempts to add to the body of literature by investigating the effect of AR on EFL elementary students. It also aims to explore teachers' perceptions of AR, and its effect on students' autonomy.

METHODOLOGY

Study Design

The study followed a quasi-experimental design using a pre-test and a post-test to investigate the impact of using AR on EFL elementary students learning. A quasi-experimental approach is a process for collecting and empirically analysing data for designed control and experimental groups based on quantitative tools to understand a research problem (Creswell, 2012, p. 220). Moreover, two questionnaires were administered after the AR intervention. The first questionnaire aimed to investigate EFL teachers' perceptions about AR, and the other aimed to explore their perceptions of the influence of AR on students' autonomous learning.

Sample

The sample of the study included 72 Saudi EFL female students randomly chosen from one of the public elementary schools in Riyadh, Saudi Arabia. All participants were about 12 years old in the sixth grade. They started studying English at grade four. They were randomly divided into two classes. One class represented the control group, and the other class represented the experimental group. Each group comprised 36 students. Moreover, 80 Saudi EFL elementary teachers participated in the study. They were voluntarily asked to participate in filling the study questionnaires. They were informed about the study purpose and aim and were ensured that their data would be kept confidential

Augmented Lessons

A module of the 6th grade textbook *Smart Class 5* was chosen. The module has 4 lessons which are: (1) My New House, (2) Smart Kids, (3) Our World, and (4) Let's Play. These four lessons were particularly chosen because they included events and situations that could be easily used in AR, making them ideal for use with AR application (HP Reveal). The experimental group received the learning contents of these lessons through the AR application (HP Reveal) which was used to create Auras related to the topics. The advantage of the HP Reveal app is that it can be easily used by a teacher or a student. Using the camera of a mobile device, the teacher or the student can point at any object and view AR experiences that merge between the real and digital worlds through converting the object into a video or an animation.

Research Setting and Procedures

After obtaining the ethical approval from the Ministry of Education, the experiment was conducted in the classroom and lasted for four weeks, two hours a week. Similar to the procedures of Alsowat (2016), the experimental group was taught using AR technology as follows:
1. During the first two classes, the students were trained on using the HP Reveal app in learning *Smart Class 5*.
2. The auras were created using the picked images and videos that suit the lessons and HP Reveal app.
3. The students who did not have smartphones were asked to follow with their peers' smartphones.
4. All students had a wireless network connection which enabled their participation.
5. All students were provided with Auras through sending them AR lesson links to be saved in their devices.
6. During the lesson, the students started by previewing the lesson to answer some pre-learning questions.
7. Then, they were asked to use their smartphones to have a look at the Auras associated with the topic to take some notes.
8. Next, they answered *Smart Class 5* learning questions.
9. Students were asked to revise the lesson by watching the Auras at home and answer their homework questions.

Instruments and Data Collection

The instruments used in the study were as follows:

1. A pre-test and a post-test: the pre-test and post-test are designed based on the sixth-grade English textbook *Smart Class5* provided by the Ministry of Education. They include five main questions with 20 items that cover the skills and subskills in the textbook (reading, listening, grammar, and vocabulary). The pre-test was administered to the control and experimental groups to ensure that there were no differences between them before the AR intervention. By the end of the intervention, the same test was then administered as a post-test to investigate whether there were any differences between them as a result of implementing AR.

2. Perception questionnaire: Teacher perceptions about AR are measured with an 18-item questionnaire based on five-point Likert scale ranging from1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, to 5: Strongly Agree. The items of the questionnaire were adapted from different studies in the literature (Alsowat, 2016; Diaz-Noguera, 2017; Khan et al., 2019; Küçük et al., 2014).

3. Autonomy questionnaire: a questionnaire about how teachers perceive the effect of AR on students' autonomy is measured with 14-item questionnaire based on five-point Likert scale ranging from (1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, to 5: Strongly Agree). The items of the questionnaire were developed based on the available literature (Alsowat, 2016; Genc, 2015; Joshi, 2011).

Pilot Study

The pilot study included 30 students for conducting pre- and post-tests, and 30 teachers to fill in the autonomy and perception questionnaires. The students and teachers were then excluded from the actual study. The pilot study helped to:

1. Measure and strengthen the validity and reliability of data collection instruments.
2. Be aware of the difficultie or challenges to overcome them.
3. Facilitate the application of the field stud .

Accordingly, the pilot study confirmed the satisfaction of several important conditions for conducting the field study, including internet connection, smartphone availability, and validity and reliability of the study instruments as shown in the next subsection.

Validity and Reliability

To verify the content validity of the test, it was sent to a panel of experts in EFL education for assessment. They found the test valid for the 6th grade elementary students.

As for the reliability of the designed test, test-and-retest method was used to ensure that there were no significant differences between different periods when applying the same test. To achieve this, the same test was applied during different periods of time. Differences between the results were tested using a paired sample t-test as shown in Table 1.

The results in Table 1 show no significant differ nc-es($\alpha <= 0.05$) between the results, even after conducting the designed test over different periods. This indicates the reliability of the test and its ability to measure what it is supposed to measure.

To validate the content of the perception and autonomy questionnaires, they were also sent to a panel of experts in EFL education for their comments. They provided some valuable recommendations as to the points that should be removed, added, or modified. As a result, all their suggestions, modifications and amendments were followed and modified in the final version of the instrument

To measure the reliability, Cronbach's alpha reliability was used based on the 30 responses representing the pilot sample of the target population. Table 2 shows Cronbach's alpha coefficient

The values of Cronbach's α for the questionnaires ranged from 0.81 to 0.90 which confirm an acceptable level of reliability.

RESULTS

What is the Effect of using AR on Learning English among EFL Elementary Students?

Independent sample t-tests were used to examine whether there was any significant difference in the means of students' test results between the control and experimental groups. Table 3 shows the means and standard deviations for the control and experimental groups in the pre- and post-tests, and Table 4 shows the results of the independent sample t-test.

The results in Table 4 show that there was no significant difference between the control and experimental group in the pre-test ($\alpha >= 0.05$) before starting AR intervention. However, there was a statistically significant differenc between the two groups in the post-test ($\alpha <= 0.05$) indicating the positive effect of using AR on the development of

Table 1. Augmented reality test differences

Mean		Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper				
Pair 1	test - retest	-0.09667	0.20126	03674	-0.16182	-0.01151	-2.359	29	0.0.62

language learning for EFL elementary students. This significant difference leads to a significant effect, which can be measured using a simple regression test as shown in Table 5.

The results in Table 5 show the effect of adopting AR classes on students' achievement in the post-test. The value of R^2 indicates that AR classes can explain 37% of the variance between students in both groups.

What are Teachers' Perceptions Regarding the Use of AR in Elementary Schools?

This section describes the responses to the perception questionnaire completed by EFL teachers. Based on the five point Likert scale's weight descriptors (5: Strongly agree, 4: Agree, 3: Neutral, 2: Disagree, and 1: Strongly disagree),

Table 2. Reliability test

Tool	Cronbach's α
Autonomy questionnaire	0.81
Perception questionnaire	0.90

The values of Cronbach's α for the questionnaires ranged from 0.81 to 0.90 which confirm an acceptable level of reliability.

Table 3. Group statistics

	Group	N	Mean	Std. Deviation
Pre-test	Control	36	8.7500	3.30692
	Experimental	36	9.6111	2.51030
Post-test	Control	36	12.3194	4.16988
	Experimental	36	17.5694	1.90545

responses are weighted according to three categories of judgments (High, Moderate and Low).

If =

$$\text{Level of response} = \frac{\text{Strongly agree} - \text{Strongly Disagree}}{\text{No. of judgments}}$$

$$= \frac{5-1}{3} = 1.33 \qquad ,$$

then the judgment base will be:

This process helps to judge the level of the mean of teachers' perceptions. Table 7 shows the results of analysing EFL teachers' perceptions of AR.

Table 7 shows a high level of positive perceptions among teachers regarding the importance of employing AR lessons in teaching English as a foreign language. They stressed that AR motivated students to practice English. In addition, they believed that AR could be used in the domain of teaching English as a foreign language in the future. Furthermore, they positively rejected the idea that the use of AR is a waste of class time. In contrast, they highly recommended using this experience for its advantages in helping students develop their English language skills. In summary, they had positive perceptions of AR with a mean of (3.40).

How Do Teachers Perceive the Effect of AR on EFL Elementary Students' Learning Autonomy?

As for students' autonomy, all responses received by EFL teachers were classified into the same categories mentioned above based on their responses to the five-point Likert scale. Table 8 shows the results of analysing EFL teachers' responses to the autonomy questionnaire.

Table 4. Independent sample test

		F	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Pre-test	Equal variances assumed	1.78	-1.244	70	0.217	-0.86111	0.69196	-2.24119	0.51897
	Equal variances not assumed		-1.244	65.28	0.218	-0.86111	0.69196	-2.2429	0.52072
Post-test	Equal variances assumed	19.322	6.87	70	0.000**	-5.250	0.76410	-6.77395	-3.7260
	Equal variances not assumed		6.87	49.006	0.000	-5.250	0.76410	-6.78552	-3.7144

Table 5. Simple regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	R	R^2	t	Sig.
		B	Std. Error	Beta				
1	(Constant)	12.319	0.544	0.611	0.61	0.37	22.646	0.000*
	Group	4.972	0.769				6.463	

The results show how teachers perceived the importance of using AR in promoting students' autonomy. Teachers highly agreed with the idea that AR could help students use the internet and computers to study and improve their English. Moreover, their experience with AR classes made students enjoy finding information about new topics, try new learning activities, practice English, and choose English activities they could do on their own. In summary, the mean of teachers' perceptions is 3.93, which indicates a positive and worthwhile experience using AR in EFL classes.

DISCUSSION

The results of the current study show that the use of AR technology opens an opportunity to support EFL learning. After the experiment, EFL elementary students developed better language learning. In addition, the results confirm that they developed a positive attitude towards EFL learning evidenced by EFL teachers' perceptions. Teachers reported a positive effect of adopting AR classes on both students'

attitude and learning autonomy. In this study, the findings highlight the advantages that make the adoption of AR technology in EFL learning one of the promising technologies in language learning.

The use of AR technology effectively helps students to visualize and develop language skills. This result emphasizes what was found in previous studies regarding the effect of interactive learning tasks on developing students' language skills (Chen & Wang, 2015; Hsieh et al., 2014; Parmaxi & Demetriou, 2020; Pennycook, 2017; Wen, 2021).

In addition, AR technology reinforces teaches' positive perceptions of the importance of employing AR lessons in teaching English language. They emphasized that AR motivates students to practice the language. Furthermore, Teachers supported the idea that the use of AR invests class time and highly recommended using AR for its advantages in helping students develop their English language skills. The positive perceptions among EFL teachers towards using AR technology is also supported by previous studies (Marzban, 2011; Mundy et al., 2019; Webb, 2018).

Moreover, AR technology boosts EFL students' autonomy and provides an opportunity for visual investigations. With AR technology, students can learn English autonomously, develop time management skills, finish the lesson task on time, choose English activities they can do on their own, be aware of their mistakes and correct them, reduce their reliance on teachers' guidance, use the internet and

Table 6. Measurement Levels

Range	Judgment
1 – less than 1.34	Low
2.34 – 3.66	Moderate
3.67 – 5	High

Table 7. Means and Standard Deviations of the Perception Questionnaire

N	Item	Mean	Std.D	Rank
1	The materials presented using AR are eye-catching.	3.91	0.732	9
2	Using AR to teach English can stimulate students' curiosity.	4.01	0.771	4
3	Using AR makes students' learning complicated.	2.79	1.052	12
4	AR provides a variety of skills, exercises, illustrations, etc., that help to keep students' attention on the lesson.	4.01	0.771	4
5	It is difficult to use AR applications.	2.79	0.977	12
6	Using AR is a waste of class time.	2.48	1.055	18
7	Using AR gives students pleasure.	4.07	0.742	3
8	Students get bored when they engage in AR learning.	2.56	1.089	14
9	Using AR helps students to release tension.	3.83	0.742	10
10	AR has a negative influence on students' learning.	2.49	1.079	15
11	Using AR helps students to develop useful skills.	3.94	0.735	8
12	There is no need to use AR in the class.	2.49	1.147	15
13	AR motivates students to practice English as a foreign language.	4.11	0.711	1
14	Using AR does not attract students' attention.	2.49	1.147	15
15	Using AR allows students to enter a fantasy world.	3.96	0.665	7
16	AR lessens students' concentration on the lesson.	3.2	1.024	11
17	Using AR provides a feeling of reality.	3.99	0.738	6
18	I believe AR could be used in teaching English as a foreign language domain in the future.	4.09	0.86	2
	Overall Mean of Teachers' Perceptions	3.4		

Table 8. Means and Standard Deviations of the Autonomy Questionnaire

N	Item	Mean	Std.D	Rank
1	With using Augment Reality (AR), students have the ability to learn English autonomously.	3.76	0.931	12
2	AR helps students to know the lesson objectives.	3.85	0.828	9
3	AR helps students develop time management skills.	3.75	0.921	14
4	AR motivates students to preview the lesson before class.	3.96	0.906	7
5	AR helps students to finish the lesson task on time.	3.66	0.841	15
6	AR helps students to use English language resources willingly.	4.01	0.893	5
7	AR makes students choose English activities they can do on their own.	4.06	0.847	4
8	AR helps students to try new learning activities to practice English language.	4.09	0.799	3
9	Students learn English better when they study with AR.	4.01	0.907	5
10	AR helps students to realise their mistakes and correct them.	3.79	0.791	11
11	AR makes students enjoy finding information about new topics on their own.	4.15	0.813	2
12	AR helps students to reduce their reliance on teacher's guidance for their learning experiences.	3.76	0.997	12
13	AR helps students to make decisions and set goals for their learning.	3.85	0.765	9
14	Besides the content prescribed in the course, AR makes students read extra materials in advance.	3.96	0.787	7
15	AR helps students to use the internet and computers to study and improve their English.	4.28	0.811	1
	Overall Mean of Students' Autonomy	3.93		

computers to study and improve their English and make decisions and set goals for their learning. These results were also confirmed by EFL teachers and are consistent with previous studies (Boettcher, 2007; Ogawa, 2016; Wasko, 2013). AR motivates elementary students to have the experience of learning by themselves in their free time at home, and to spend more time in e-learning which can help improve students' cognitive skills, comprehension of new facts and experiences. This result aligns with several studies in diffe - ent contexts indicating the benefits of AR technology (Chen & Wang, 2015; Hsieh et al., 2014; Pennycook, 2017).

Therefore, AR technology motivates students to learn new things, attempt new EFL learning activities, realise and correct mistakes and enjoy finding information about new topics. These results align with the constructivist theory, which is clear in the case of using AR learning environments (Wasko, 2013). Hence, students become able to continually integrate EFL skills and construct new experiences.

CONCLUSION AND RECOMMENDATIONS

The study indicates the positive effect of using AR on developing EFL elementary students' language learning. It also shows that teachers perceive the use of AR as valuable, motivating, and beneficial as it helps students to develop language skills and fosters autonomous learning. Based on the results of the study, it is recommended to provide training workshops for teachers about AR technology use in language teaching and to guide them on how to choose appropriate tasks and assessment strategies so that they could implement AR technology in a more efficien way. Additional training could give teachers more confidence and ensure that they are using AR effectivel . AR technology assessment may also enable teachers to make informed decisions on its use in the classroom. Further, it is desirable to make AR applications as part of language textbooks for students to study individually, as well. Since AR technology fosters greater students' autonomy, it is important to provide them with more guidance through textbooks.

SUGGESTIONS FOR FURTHER RESEARCH

For future work, the study suggests conducting new research to reveal the requirements of the technological tools necessary for the use of AR technologies in schools. This is not limited to the teaching of English, but rather the study of its suitability for other courses, as well. In order to increase students' involvement in AR technology use in language learning, it is necessary to study how students feel about it. Therefore, in-depth interviews with students would be valuable for gaining a better understanding of their experiences and possible challenges. Finally, it is recommended to conduct interviews with teachers to learn more about what they think about AR use in classrooms, how it could be implemented, what resources and skills they lack (if any), and what their general thoughts about this technology are.

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