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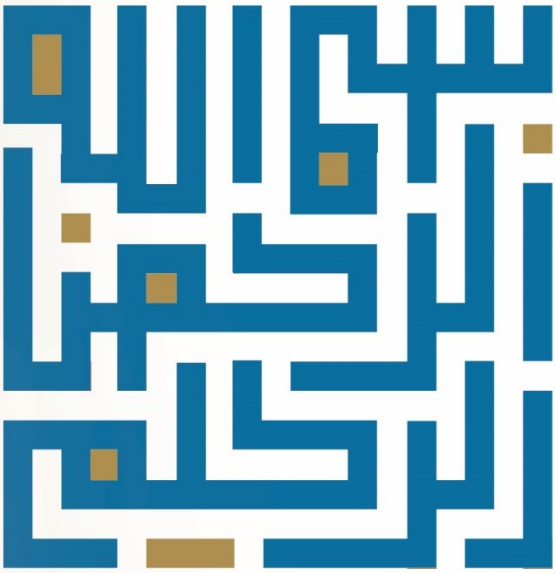
البحوث المنشورة في المجلة تعبرعن آراء الباحثـين ولا تعبر بالضرورة عن رأي المجلة



قواعد وضوابط النشر في المجلة

- أن يتسم البحث بالأصالة والجدية والابتكار والإضافة المعرفية في التخصص.
- لم يسبق للباحث نشر بحثه.
- أن لا يكون مستلاً من رسالة علمية (ماجستير / دكتوراة) أو بحوث سبق نشرها للباحث.
- أن يلتزم الباحث بالأمانة العلمية.
- أن تراعى فيه منهجية البحث العلمي وقواعده.
- أن لا تتجاوز نسبة الاقتباس في البحث المقدم (25%).
- أن لا يتجاوز مجموع كلمات البحث (12000) كلمة بما في ذلك الملخصين العربي والإنجليزي وقائمة المراجع.
- لا يحق للباحث إعادة نشر بحثه المقبول للنشر في المجلة إلا بعد إذن كتابي من رئيس هيئة تحرير المجلة.
- أسلوب التوثيق المعتمد في المجلة هو نظام جمعية علم النفس الأمريكية (APA) الإصدار السابع، وفي الدراسات التاريخية نظام شيكاغو.
- أن يشتمل البحث على : صفحة عنوان البحث، ومستخلص باللغتين العربية والإنجليزية، ومقدمة، وصلب البحث، وخاتمة تتضمن النتائج والتوصيات، وثبت المصادر والمراجع، والملاحق اللازمة مثل: أدوات البحث، والموافقات للتطبيق على العينات وغيرها؛ إن وجدت.
- أن يلتزم الباحث بترجمة المصادر العربية إلى اللغة الإنجليزية.
- يرسل الباحث بحثه إلى المجلة إلكترونيًا ، بصيغة (WORD) وبصيغة (PDF) ويرفق تعهدًا خطيًا بأن البحث لم يسبق نشره ، وأنه غير مقدم للنشر. ولن يقدم للنشر في جهة أخرى حتى تنتهي إجراءات تحكيمه في المجلة.
- المجلة لا تفرض رسوما للنشر.

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The effectiveness of applying Augmented Reality technology on learning English vocabulary, and motivating elementary students toward learning from Their Perspectives

فاعلية استخدام تقنية الواقع المعزز في تحصيل مفردات اللغة الإنجليزية، ودافعية طلاب المرحلة الابتدائية نحو التعلم من وجهة نظرهم

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المستخلص

هدفت هذه الدراسة إلى معرفة ما إذا كان تطبيق تقنية الواقع المعزز (AR) يمكن أن يساعد متعلمي اللغة الإنجليزية كلغة أجنبية على تطوير مفرداتهم. كما فحصت آراء الطلاب حول استخدام تقنية (AR)على مستوى دافعية الطلاب. ولتحقيق هذا الهدف، اشترك في الدراسة ٧٣ طالبة في الصف السادس في مدرسة ابتدائية في منطقة عسير في المملكة العربية السعودية. تم تقسيمهم بطريقة عشوائية إلى مجموعتين: المجموعة التجريبية والمجموعة الضابطة. استخدمت الدراسة المنهج ذو التصميم التجريبي باختبار قبلي وبعدي. كشفت نتائج هذا البحث عن وجود فروق ذات دلالة إحصائية بين متوسطات الدرجات لصالح المجموعة التجريبية. بالإضافة إلى ذلك، أشارت نتائج الاستبيان إلى أن استخدام الواقع المعزز له تأثير إيجابي على دافعية الطلاب للتعلم. بالاعتماد على نتائج الدراسة، نقترح استخدام تقنية الواقع المعزز عند تدريس جميع مهارات اللغة الإنجليزية.

الكلمات المفتاحية: الواقع المعزز، مفردات اللغة الإنجليزية، اللغة الإنجليزية كلغة أجنبية، الدافعية

Abstract

This study aimed to investigate whether or not the application of augmented reality (AR) technology can assist students learning English as a foreign language in developing their vocabulary. It also examined students' opinion about the use of AR on their motivation. To accomplish this purpose, 73 sixth-grade female students at an elementary school in Aseer region in Saudi Arabia contributed in the study. They were divided into two groups: the experimental group and the control group. The study used pretest-posttest experimental group design. The results of the investigation revealed statistically significant differences in the mean scores, which were favoring the experimental group. In addition, the results from the questionnaire indicated that the use of AR have a positive effect on motivating students to learn from the students' perspectives. This research suggests incorporating technology into teaching all aspects of language .

Keywords: Augmented reality; English vocabulary; EFL; motivation.

Introduction

In Saudi Arabia, English was first included in the curriculum of intermediate and senior schools in 1924 (Al-Shabbi, 1989). However, instruction in English did not begin in primary schools until 2004. Public schools often begin teaching English to students beginning in the 5th grade. Then, in 2021 the Saudi Ministry of Education imposed the English language to be taught to the students starting from the first grade to help improve learning outcomes. Students take three-four English sessions per week during the elementary stage. In contrast, at the high school level, the overall number of classes fluctuates from four to five based on that school type (Ministry of Education, 2021). Even though instruction in the English dialect is considered a necessary component of a student's education in Saudi Arabian institutions, learning outcomes aren't matching up with the prospects of the courses. Further, the students' overall English language skills are rated subpar. For example, Saudi EFL learners had an average score of TOEFL score of 64 out of 120, which is considered to be very low (Alqahtani, 2019).

Several studies have been carried out to investigate the reasons that led to the inadequate level of English among Saudis, and they focused primarily on factors behind the difficulty of English reading. They found out that restricted vocabulary of EFL students in Saudi Arabia was recognized as one of the primary contributing reasons (Alahmari, 2019; Khan et al. 2020; Binhomran et al. 2021). The restricted improvement of Saudi learners learning EFL could be attributed to several factors, including insufficient disclosure of English, inadequate training for teachers, a lack of opportunities to practice English, and the inflexible design of school textbooks that do not allow teachers to experiment a variety of instructional strategies. This argues that textbooks for teaching English to speakers of other languages ought to be more adaptable, enabling students to encounter a variety of various settings and instructional methods (Al Nasser, 2015). Binhomran et al. (2021) researched the factors contributing to Saudi EFL students' inadequate reading skills. He disclosed that Saudi learners studying EFL have low reading abilities in

their L1 and L2. In addition, the students of EFL said that the emphasis was placed more on extensive reading than on reading skills. Further, the learners' limited vocabulary caused them to struggle when confronted with unexpected subjects.

In EFL, vocabulary is the most basic and essential component of oral communication. Although it is only a small component of learning any foreign language, building someone's vocabulary is essential. Learning new language should begin by studying its vocabulary (Eshonkulova, 2021). Further, to be able to communicate together in a foreign language, there is a need to be familiar with the various most fundamental aspects of vocabulary and to put as much effort as possible into practicing communication abilities. (Walter-Laager et al., 2017).

Increasing overall vocabulary is one of the most important aspects of improving someone's' English language. People's ability to expand their vocabulary might give them many different chances. It may greatly influence their ability to accurately and successfully communicate ideas to others. When people first start learning new

words, storing them throughout their memory may be challenging since everyone seems to have a list of vocabularies that they use daily. This makes it difficult to remember unfamiliar phrases. One's vocabulary recall will increase from 10-20 times if they repeat a certain set of keywords several times. One will have a much easier time remembering the new words they have just learned if they make it a habit to use in everyday interaction (Walter-Laager, 2017). Further, learning vocabulary in a way that engages the students and makes learning relevant may help to improve students' learning, which may be done through the use of technology.

Over the past twenty years, technology has evolved into a potent instrument that may significantly improve one's educational experience. The incorporation of digital technology into the educational system is happening more often, as seen by the proliferation of touch-screen devices and app availability. In addition, educators have begun investigating the possibilities of applications that promote the acquisition of second languages and, indeed, the instruction of such languages. The field of education has been paying more attention to Augmented Reality (AR) recently (Alahmari, 2019).

Integrating real-time digital data with a person's physical surroundings is the definition of augmented reality. Users of augmented reality perceive the actual world but with created perceptual information superimposed in front of it, as opposed to users using virtual reality, which produces an entirely fabricated environment. AR may be used to visually alter the natural settings that users interact with to give them new details. AR's ability to successfully combine digital plus three-dimensional elements with a person's experience of the actual environment is the technology's most significant advantage. AR may be used for several functions, from assisting decision-making to amusing. By using a device such as a cell phone and glasses, AR provides the user with information that is auditory, visual, and involves other sensory types. This content is superimposed onto the gadget to produce an interlaced experience in which the interaction with electronic content alters the user's perspective of the actual world. The information overlay may either be given to an existing environment or used to conceal a portion of such natural surroundings (Singhal et al., 2012).

There has been considerable discussion over whether or not AR is beneficial in influencing the motives of EFL students. According to Alahmari (2019), AR has a beneficial effect on students' levels of motivation. This may be attributable to AR educational experiences' inventiveness, which encourages participants to get wholly engaged throughout the learning process. In addition, he claims that AR makes learning easier since it improves student understanding more than other instructional materials. The ability of AR technology to combine the virtual and physical worlds to provide an improved reality paves the way for new educational opportunities.

Statement of the problem

Despite the continuous development of the English language curricula by those in charge of the educational process in the Kingdom of Saudi Arabia, students' levels in reading are still very low as indicated by Alahmari (2019) and Binhomran, et al. (2021). They explained the reasons behind that majorly due to the students' lack of knowledge in vocabulary. Besides the fact that the researcher of the current

study has been working for a longtime as a supervisor of English language pre-service teachers during their practicums in teaching, and she has identified students' limited knowledge of vocabulary. However, a similar case can be recognized in educational institutions in developed countries as they are facing a lack of motivation and interest in students towards traditional academic practices. This commonality is underlined by the growing distance between teaching procedures and the students' technological way of life contributes to widen the gap (López, 2013). Further, Al Nasser (2015) added that poor teaching training, poor technology use in the classroom and lack of motivation are reasons for having low level of student 'English.

In these countries like in Saudi Arabia, young learners joyously spend many hours using technology. The utilization of technology should be considered in teaching English. One way of benefiting from its usage is to apply Augmented Reality AR in teaching vocabulary. Some studies have already purported that AR helps enhance students' learning outcomes in terms of learning achievement, motivation, engagement, attitude, and satisfaction in a variety of subjects (Ferrer-Torregrosa et al. 2015; Küçük et al. 2016). However, the study on the uses of AR in education remains in its early stages, resulting in a need for more research regarding the impacts and consequences of AR in education. Therefore, this research aimed to explore the impacts of using AR application on vocabulary learning for sixth grade elementary students. In addition, it purposed to examine its effectiveness on motivating students to learn vocabulary. Additionally, this research aims to examine the effectiveness of AR on learning vocabulary besides indexing the motivation of the students to learn. There is a plethora of studies demonstrating that students' motivation significantly impacts students' learning and no possible progress can be made without teaching vocabulary in a way that interests students to learn and motivate them. (Di Serio et al. 2013; Estapa & Nadolny 2015; Ferrer-Torregrosa).

Research questions:

- What is the effectiveness of applying augmented reality on students' ability to remember vocabulary meaning?
- What is the effectiveness of applying augmented reality on students' motivation to study English from the students' perspectives?

Definition of the terms

Augmented reality:

Sometimes called "mixed realism," augmented reality is an interactive browser experience superimposed promptly over a live, physical setting with seamless integration. "AR provides a seamless interface for users that combines both the real world and the virtual world. Users can interact with virtual objects that are interposed on real scenes around them and obtain the most natural and genuine human–computer interaction experience" (Cai. et al., 2014, p. 31). Augmented reality (AR) is a technology that allows for the superimposition and integration of digital information into the real world around us. Augmented reality is a technique that may assist us in transforming our local surroundings into learning, working, and

leisure places. (Acosta et al. (2019). The researcher defines it as a modern technology that gives its user the illusion that he is immersed in the virtual world.

Motivation:

Motivation is defined as an internal process. It is a condition inside us that requests a change in the environment or the self. Motivation provides the person with the direction and drive that is needed for him to be engaged with the environment in an open-ended, adaptive, and problem-solving way (Reeve, 2015). The researcher defines it as internal or external psychological state that drives the student to behave in a positive way to reach a specific goal. It is measured through four themes: attention, relevance, confidence, and satisfaction.

Achievement:

"Achievement refers to a result gained by effort". something that someone got or did after working to make it happen. Then, it gives the feeling of satisfaction (Merriam-Webster Dictionary, 2023). The researcher defines it as students attaining a desired aim after learning vocabulary with the AR technique, and it will be measured by a vocabulary achievement test.

Literature review

Vocabulary learning:

When it comes to EFL students' potential to become fluent in the target language, the function of language is seen as being of the utmost importance. Although reading, writing, listening, and speaking are the four main skills of language learning, students will have a tough time progressing any of these areas without first amassing an extensive vocabulary. According to (Alshaikhi and Joy, 2021), it will be challenging to express anything with the absence of vocabulary. Learning a second language requires a significant quantity of vocabulary to be committed to memory and then practiced regularly. The instruction of vocabulary may encompass more than only implicit and explicit methods, as well as activities in groups and individually. Acquiring new words and their pronunciation and meaning is all a part of teaching vocabulary. Additionally, it entails understanding the syntactic, etymological, and stylistic features of individual words.

According to a report by Nation's, students of English as a foreign language must have a vocabulary of at least 5000 words to grasp the meaning of an English text. Several methods and vocabulary instruction strategies have been investigated to determine their effectiveness (Al-Megren et al., 2018). These include teaching vocabulary by switching from one language to another, properly taught through reading, and contextualized but decontextualized vocabulary instruction (Nation, 2015) and teaching through the use of augmented reality (Binhomran & Altalhab, 2021).

The employment of (AR) in EFL vocabulary acquisition:

According to Alrige et al. (2021), the scientific definition of augmented reality is as follows: A kind of virtual reality in which the participant's excellent choice display is translucent, enabling a better sight of the actual environment. The broad meanings of AR suggest that it could be formed but adapted through various

devices, including a desktop computer, a portable device, and even a multitouch tablet. The high degree of excitement that students have for participating in AR experiences has been emphasized in several research. Participants in these studies report greater pleasure and seem ready to repeat similar AR experiments. Scientists have concluded a beneficial connection between augmented reality technology and students' motivation.

In the field of study on vocabulary, Li, et al. (2015) study examined the impact of AR strategy on motivating Chinese students to learn vocabulary. Five Chinese students who were taught with an application, that was built on AR, were interviewed. The results of the study showed that the use of the application increased the students' motivation in the beginning. However, the level of motivation started to decrease in the end for some reasons. First, the AR materials didn't seem to be relevant to the students' interests and experiences. Second, students' confidence was negatively affected because the learning objectives were not achieved. Last, the technical issues made the computers delay in triggering the image, which decreased the learners' satisfaction. The researcher suggested another study with a larger sample to be able to generalize the study. Therefore, this study was conducted to examine the AR impacts on larger students' motivation.

In a similar study, Walter-laager et al. (2017) investigated the effects of virtual reality on the acquisition of Language vocabulary of age 2 children. Researchers developed an interactive word learning application and examined its impact on vocabulary learning compared with learning through picture cards. The study focused on whether adult accompaniment to the children during learning through the app or the picture-cards have a positive impact on the acquisition of vocabulary. The findings indicated that children who were accompanied by an adult while using word-learning application showed the largest growth in vocabulary. On the other hand, children who used picture cards with or without adult showed smallest growth in vocabulary.

Similarly, Alharbi (2022) evaluated the possible influence of AR on forty-eight Saudi students studying English as a foreign language. Students were assigned to develop vocabulary flashcards using the newly available technology. To evaluate the participants' feelings towards the technology used, observations, interviews, and a questionnaire with a semi-structured format were all conducted with them. According to the research findings, the use of augmented reality has had a beneficial impact on the levels of motivation and engagement shown by the students. In addition, the research findings indicated that augmented realism helped promote learning while promoting the development of vocabulary memory among students.

According to these studies, AR has the potential to boost both students' interest and academic achievement. However, other research claims that augmented reality is more challenging than desktop-based options (Binhomran et al.,2021). These claims are based on the opinions of AR users. Regarding Binhomran et al. (2021), several participants reported usability concerns in experiments where AR head-mounted devices were used. Even though the students felt motivated and interested while participating in the AR activity, they judged the usability of AR systems as being worse than that of personal computer equivalents. Learners may be more

driven to try new tactics if they are given the proper training to employ such strategies (Baabdullah et al., 2022). "The second most essential function of the vocabulary instructor is to educate learners how to employ vocabulary tactics," as per Nation and Webb (Nation, 2015). Such strategies include learning through word cards, estimating from context, memorizing word components, and utilizing a dictionary.

Augmented reality is dynamic, engaging, and immersive throughout the sense because it allows students to have real-world experiences in a virtual setting. The research by Li, et al. (2015) exemplified the immersive aspect of AR by showing how such a context-aware immersion activity might enhance the learning experiences, leading to better student outcomes. A learning environment may become immersive by incorporating real-world tales, including learner-required materials inside the environment, providing as much realism as feasible, and utilizing real-time synchronized occurrences. That level of immersion is made possible by the technology and layout of AR. Learners will have an easier time envisioning the fictional world if immersed in it. This benefit may be used in the classroom to assign students fiction works that will help them improve their English literary skills, whether for pleasure or schoolwork (Binhomran et al., 2021).

AR strategy effects on Motivation:

Motivation based on Keller's definition, refers to the student's desire to be engaged in a learning environment. To be specific, Keller's developed four dimensions to explain motivation. The dimensions are: attention, relevance, confidence and satisfaction (ARCS). Keller hypothesized that learner's attention can be gained through stimulating curiosity or using uncertainty to interest students. The relevance is the second stage to motivate students, which can be established through allowing the choice of the strategy. Then, the confidence step, when students are confident about their ability to meet the objectives, their motivation increases. Last stage is the satisfaction of the students about their learning outcomes and the consistency of it with their expectation. If the students reach the confidence level; their motivation will be increased (Keller and Litchfield, 2002).

Motivation can be increased based on the type of strategies used to teach EFL. The use of multimedia in teaching English helps rise students' motivation and leads to higher learning. Multimedia involves the use of interactive application which integrates color, images, texts, and audio sound in a single application. Multimedia offers a potentially venue for helping improve student understanding of languages (Gilakjani, 2012). An example of the multimedia is AR different types of applications.

As per Acosta et al. (2019) research, the findings indicated that students are more motivated when AR is used in the classroom, as measured by variables like attention, relevance, confidence, and satisfaction, as demonstrated in their performance on tests given to such experimentation groups as opposed to the standard control. Students who struggle academically may benefit from using augmented reality (AR), which has emerged as a viable option among today's available technological tools. The impacts of the AR technological approach on the

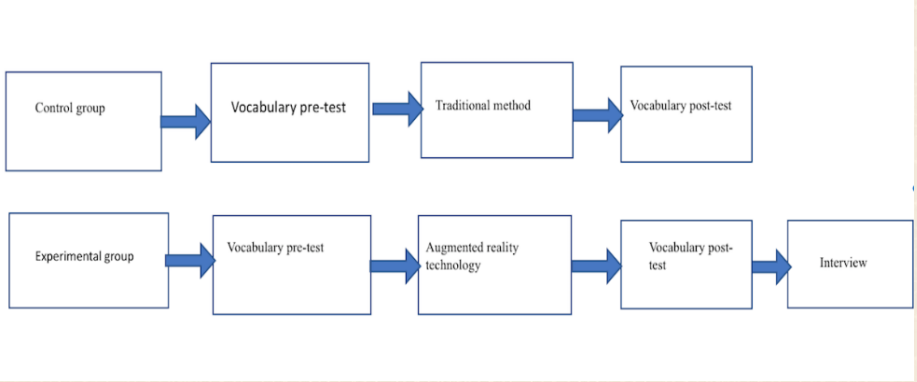
degrees of motivation experienced by students with learning difficulties are being explored as the study motivation (Acosta et al.,2019).

Method

Research design:

This research employed an experimental design by applying a pre-post experiment and closed-ended questionnaire. It purposed to investigate the effectiveness of the AR technology on the vocabulary of sixth grade elementary school students learning EFL. In addition, it aimed to investigate the use of AR on students' motivation to learn from their perspectives. All students took a pre-test, taught the vocabulary with either the AR or the traditional method, and were given the post-test (see diagram 1.).

Diagram 1: procedure of the study.



Participant:

In this research, a total of 73 Saudi female sixth-graders participated. All participants were native learner of Arabic language and had begun studying English just at the age of nine to ten, attending one lesson of forty-five minutes, three days a week. There were two distinct groups within the sample: the experimental and the control group. Both groups' members were assigned randomly; 38 students in the comparison group and 39 students in the experimental group. The research began with seventy-seven individuals, yet four participants' information was excluded from the evaluation because they were not present for the posttest. Therefore, the sample consisted of 35 students in the comparison group and 38 students in the experimental group.

Instruments:

1. AR Application

This study used an AR application called HP reveal to examine AR's impact on EFL students' English vocabulary. HP reveal is a mobile application which is available for iPhone and android system and built for AR technology. Ten flashcards were designed by writing a word, from the chosen list to be learned, on each

flashcard. Then, each word was scanned by the app and attached to it a picture that represents it. For example, the written form of the word "volleyball" was printed on the card, then a picture of people playing volleyball is associated with it. Last, the word is saved with a name.

2. Vocabulary pre-posttest.

The investigator constructed the vocabulary pre-posttests as a series of ten words, and they consisted of two parts. First, the students were asked to match each word or phrase with the picture that best represents it. Second, they were asked to write the meaning of the words in Arabic. Both the pretest and posttest exam versions had the same ten words with similar questions. The words that were examined were at an EFL elementary level of difficulty and chosen from the sixth-grade students' English book. The book is called *We Can*, and the vocabulary were chosen from the third unit (sport and activities). The list of word was: skydiving, tennis, horse riding, volleyball, scuba diving, hang gliding, bungee jumping, rock climbing, jog, and snowboarding.

Validity and Reliability:

An exam of 13 words was first conducted on a pilot study of another comparable group sample who was not a part of the study. Then, the researcher selected ten words from the list to be used in the investigation, which were less known to the students. This pilot study aimed to gauge the amount of linguistic knowledge possessed by the students, and to examine the clarity of the questions to the students to be a valid test. Further, the reliability of the test was run through evaluating it using Cronbach's Alpha method =92%, which means high level of reliability.

3. Closed-ended questionnaire:

The researcher used closed-ended questionnaire to investigate the students' opinion about the impacts of using AR strategies in teaching vocabulary on their motivation to learn. The questionnaire was adapted from RIMMS which was developed from the Instructional Materials Motivation Survey (IMMS). This survey was built to measure students' perceptions of teaching tools. It consists of four dimensions: attention, relevance, confidence and satisfaction. Each dimension contains 3 questions and the survey was designed in the form of five-point scale ranges from strongly agree to strongly disagree (Keller, 2009). This model for motivation was used in some studies and tested its validity and reliability (Loorbach et al., 2015).

Reliability:

The reliability of the questionnaire was measured in Loorbach et al., (2015) study using Cronbach's Alpha method. It was measured for each dimension as: attention=90%, relevance =82%, confidence=89%, and satisfaction=85%. However, the reliability for the questionnaire in this current study was evaluated as well. It was done by calculating the alpha-Cronbach reliability coefficient for each dimension as shown in Table-1. It is evident from Table -1 that the values of Cronbach's alpha stability coefficients are high for each of the dimensions of the questionnaire.

Table 1: Cronbach's alpha coefficients

Dimensions	alpha-Cronbach coefficient
Attention	0.74
Relevance	0.70
Confidence	0.77
Satisfaction	0.78
Total	0.93

The reliability coefficient was also calculated using the split-half method for each dimension (see Table, 2). It is evident that the values of split-half coefficients stability coefficients are high for each of the dimensions of the questionnaire.

Table 2: split-half coefficients

Dimensions	split-half coefficients
Attention	0.87
Relevance	0.69
Confidence	0.70
Satisfaction	0.76
Total	0.92

Validity:

a-Internal consistency validity:

The validity of the internal consistency of the questionnaire was analyzed by calculating the correlation coefficients between the degree of each statement with the degree of the dimension and total degree of questionnaire to which it belongs as shown in Table 3.

Table 3: Internal consistency validity of statements

No. of statement	Correlation with dimension	Correlation with total
1	0.66**	0.58**
2	0.83**	0.82**
3	0.93**	0.85*
4	0.81**	0.70**
5	0.71**	0.76**
6	0.84**	0.77**
7	0.86**	0.80**
8	0.86**	0.76**
9	0.77**	0.74**
10	0.81**	0.70**
11	0.88**	0.87**
12	0.82**	0.79**

Correlations significant at P> 0.01

It is clear from the previous table-III that all the statements are related to the degree of the dimension to which they belong with positive correlation coefficients and are statistically significant at the level (0.01), In addition, all the statements are related to the total degree with positive correlation coefficients and statistically significant at the level (0.01). This means that all the statements have a high degree of internal consistency validity.

The validity of the internal consistency of dimensions was analyzed by calculating the correlation coefficients between degrees of dimensions and total degree of questionnaire as shown in table 4.

Table 4: Internal consistency validity of dimensions

Dimensions	Correlation with total degree
Attention	0.93**
Relevance	0.94**
Confidence	0.92**
Satisfaction	0.94**

Correlations significant at P> 0.01

It is clear from the previous table- IV that all the dimensions are related to the total degree of questionnaire with positive correlation coefficients and statistically significant at the level (0.01), This means that all the dimensions have a high degree of internal consistency of validity.

Procedure:

In order to carry out the study, the researcher introduced herself to the students and explained to them that she will be conducting a study to examine the impacts of a strategy on vocabulary learning. She assured that students' participation is optional and they can withdraw from the study at any time. Further, they were told that their participation is confidential, and the results will only be used for the research. That means it will not have any effect on their class grade. Then, the students in both groups were provided with the pre-test to measure their knowledge about the list of vocabulary, and to check the equivalency of both groups. After that, students in each group was randomly assigned to form either the control group or the experimental group. Then, one group was taught the vocabulary with the traditional strategy, while the other group was taught with an augmented reality strategy. The students in the augmented reality strategy group were informed that they will be taught new vocabularies based on a student-centered model, and AR technology. They were introduced with it, and how it will be implemented. After that, they were taught the list of vocabulary with AR strategy for the whole class period. On the other hand, other group was taught the same list of vocabulary with the traditional way. Two weeks later, both groups were provided with the post-test to examine the impacts of using AR strategy on learning vocabulary. After that, students in the experimental group were given the questionnaire to explore their motivation toward the use of AR strategy in teaching English vocabulary.

Regarding the AR strategy group, they were taught vocabulary following these steps:

First, students were introduced with the new strategy (AR) which they will be taught vocabulary with. They were shown the HP. reveal application and how it is used to scan the word on the flashcard and trigger the 3d picture of its meaning. Second, students were divided into groups of 5 and six students. Each group had the same flash cards, which were organized and numbered for the groups to be all in the same phase. Third, each group was given a tablet or a phone that had the AR application downloaded on it. Fourth, the students were instructed to scan the first word on the flashcard, and the virtual overlay appeared on the device. Fifth, the word is pronounced to them, and they were asked to pronounce it as well. Sixth, the students were required to tell the meaning of the word. Last, the same process is repeated with all the ten words.

Data analysis:

For analyzing the data of the study, two methods were used: one for the pre-test post-test and one for the closed-ended questionnaire. The Statistical Package for the Social Sciences (SPSS) program was used to analyze the data from both the tests and the questionnaire. The pre-test and post-test were analyzed through running T. test to examine significant differences` between both groups in vocabulary performance. In addition, for analyzing the questionnaire, arithmetic mean was calculated.

Results and discussion

This research purposed to investigate the impacts of applying augmented reality on learning vocabulary for sixth grade elementary students and its impacts on students' motivation. To analyze the quantitative results, the researchers used the SPSS program. First, the pre-test results were analyzed using independent sample T-test to assure the equivalency of both groups, so they can be comparable. The results as seen in table 5 showed no statistically significant differences between the students' mean scores in the vocabulary performance test of the control group (M = 2.54, SD = 1.96), and the experimental group (M = 2.92, SD = 1.58) and ($t. = 0.22$, $p > .05$). This result assures the equivalent levels of language proficiency of both groups which means the result is based on the interventions.

Table 5: Independent samples T-test of the pre-test for both groups.

Group	N	Mean	Std. Deviation	t	sig
Pre-test (experimental)	38	2.92	1.58	0.22	1.21
Pre-test (control)	35	2.54	1.96		

Results of research question 1:

To answer the first research question: What is the effectiveness of applying augmented reality on

students' ability to remember vocabulary meaning? The data from the post-test for the experimental and control group was analyzed using independent sample T. test (table 6). The findings demonstrated differences between the mean values of the

two groups. The average result for the comparison group was (M = 5.8, SD = 1.9), but the experimental group achieved a much greater mean score of (M = 7.94, SD = 1.7). Nevertheless, a value for t = 4.42, and p < 0.05 indicates that these changes constitute a statistically meaningful difference with an α = 0.00. This indicates that there was a significant difference in the vocabulary increases made by the augmented reality group.

Table 6: Independent samples T-test of the post-test for both groups.

Group	N	Mean	Std. Deviation	t	sig
Post-test experimental	38	7.94	1.71	٤٢4.	0.00
Post-test control	35	5.8	1.9		

The result of the current study indicated that the use of AR has positive effects on EFL vocabulary achievement. This result matches other studies that supported the AR positive impacts on learning vocabulary (Walter-laager et al., 2017; Alharbi, 2022). AR assisted students to learn better because it provides them with a sense of real-world learning (Yoke et al., 2019).

The participants by the end of the experiment were pleased about the AR and expressed their viewpoints with the teacher. One student said, "We are indeed the population of (iPads), and we choose to study via technology because it is far superior to literature." Another said, "It was a fun experience; this did not seem like a class; rather, it appeared to be an interesting game." From students' expressions, we understand the positive role of the AR on students' achievement and motivation.

Results of research question 2:

To answer the second research question: What is the effectiveness of applying augmented reality on

students' motivation to study English from the students' perspectives?

Questionnaire answers were analyzed. First, the degree of impact was determined based on the value of the arithmetic mean and in light of the cut-off degrees of the research tool scale. Adopting the following criterion to estimate the degree of practice. = 4) which was divided by the number of five scale periods to get the length of the period, i. e. (4/5 = 0.8). Then, adding this value to the lowest value in the scale which is (1) in order to determine the upper limit of the first period, and so on for the rest of the periods (see table 7).

Table 7: The degree of impact and relative weights

no	Mean	relative weights	degree of impact
1	1-less1.8	20- less36%	Very low
2	1.8-less 2.6	36- less 52%	low
3	2.6-less 3.4	52-less 68%	medium
4	3.4-less 4.2	0.68- less 84	high
5	4.2- 5	84- 100 %	Very high

The results of the second question indicated that the degree of impact that AR has on students' motivation is very high. The values of the mean degree were more than (4.2) for all dimensions and the total. That means the students stated that the use of AR helped them to be motivated to learn English vocabulary. The result of this study is similar to the result of Acosta et al., (2019) in that the use of AR increases the students' motivation to learn. It also supports the findings of Chan and Uhlmann, (2015), which indicated that the use of technology help increases the learners' level of motivation and saves time of learning. The satisfaction showed the highest degree of the four dimensions with a score of (91), followed with confidence and attention with a score of (90), and the relevance with a score of (88.6) see table 8.

Table 8: The degree of AR impacts on students' motivation

No. of statement	Mean	Standard deviation	relative weights	degree of impact
1	4.52	.506	90.4	Very high
2	4.53	.603	90.6	Very high
3	4.44	.685	88.8	Very high
Attention	4.5	.48	90	Very high
1	4.44	.503	88.8	Very high
2	4.50	.506	90	Very high
3	4.34	.745	86.8	Very high
Relevance	4.43	.464	88.6	Very high
1	4.57	.500	91.4	Very high
2	4.63	.541	92.6	Very high
3	4.42	.551	88.4	Very high
Confidence	4.54	.441	90.8	Very high
1	4.61	.547	92.2	Very high
2	4.47	.506	89.4	Very high
3	4.58	.551	91.6	Very high
Satisfaction	4.55	.447	91	Very high
Total	4.51	.429	90.2	Very high

Having a high score of the overall measure of the questionnaire means that the use of AR strategy helped EFL increase their motivation to learn vocabulary. Keller stated that if the students responded positively to the three dimensions; attention, relevance and confidence, then the fourth one, satisfaction will be positive. In other words, in the results from the survey, students agreed that the AR attract their attention and curiosity and engages them to learn. This was supported by Gilakjani (2012) study, that indicated multimedia can be more effective when it helps engage learners. According to the findings of Elsayed et al., (2021), students can be more motivated, when they were involved in an educational atmosphere that is both innovative and engaging.

In addition, findings related to relevance shown to be scored high when being taught with AR and these results contradict with Li, et al. (2015) study in which their participants scored low in relevance dimension. It could be because of the small sample (only 5 participants) in the study, which may have affected the validity of the result. The results of this current study indicated that linking educational content to students' current and future goals, needs, and experiences, can increase students' motivation. Further, using AR application makes learning authentic and connected with the Real-World Setting through the use of application. Furthermore, scoring high regarding the confidence dimension, means student creates positive expectations for success, and sees that his success is a consequence of his efforts. Therefore, when learners are interested in learning, find the information relevant to their lives, and being confident about it, then they will be motivated to learn. Thus, it will then make them satisfied (Keller, 2009).

Conclusion

This research showed the use of augmented reality technology in Saudi primary education, utilizing the application HP. reveal. The purpose of this study was to investigate the impact that AR has on learners' vocabulary as well as their motivation. The investigation revealed significant differences between means of tests with those differences tilting in favor of the experimentation group. Additionally, the data suggested that the use of AR led to improved levels of vocabulary and increased levels of desire among students. According to the respondents, the variables' entertainment,' 'cartoon interactive objects, "social interaction,' and the movement feature influenced the overall level of student contentment. Other aspects that contributed included: 'social interaction.

Recommendations for future research:

This study opens the door for potential researchers to examine the application of technologies in language acquisition by providing them with the possibility. Future research should be conducted on evaluating the effects of AR strategy on acquiring additional language abilities including writing, reading, listening, and speaking, since this might contribute to the expansion of CALL but also MALL study. In addition, it should be conducted on examining the AR impacts on developing other skills such as self-regulated, social skills, and autonomy skills.

Recommendations for practice:

Even though this research was carried out in Saudi Arabia, the following suggestions might be applied to a more general setting elsewhere in the world based on the presented results. According to the research findings, acquiring vocabulary via AR is affected by several elements that form a favorable environment for acquiring vocabulary. To cultivate an effective environment for learning vocabulary, it is indeed essential to take into consideration the roles that various factors play in the classroom, including different teaching methods, vocabulary techniques, the arrangement of students into factions, the students' varying stages of English aptitude, and also the students' various beliefs and behaviors (Elsayed et al.,2021). The results also suggest that the animated interacting objects using AR technology helped the students comprehend the significance of the acquired language,

increasing their desire to learn it. Therefore, those responsible for designing EFL curricula should consider incorporating technology into EFL texts. Another problem arose from the research results, which demonstrated that students rely entirely on their instructor to clarify the significance of new vocabulary terms. Consequently, students must be instructed to make explicit use of vocabulary methods.

According to the findings of this study, children stated that people enjoyed participating in team learning activities. As a result, teachers should consider grouping students together to facilitate the beginning of conversations and discussions between students and even aid them in applying social lexicon strategies. The kids' vocabulary and motivation would improve as a result of this. Additionally, those in charge of formulating EFL language policy have to give some thought to implementing the bring your own device policy since this may assist in elevating students' levels of autonomy and motivation. The present research suggests that successful digital learning be incorporated into learning languages in classrooms and institutions. This recommendation is based on the results of the investigation.

Additionally, for instructors to choose the proper tactics and assignments, they need to be educated regarding how to utilize the necessary programs and devices and incorporate these tools into their lessons. Some respondents mentioned during the lesson those old ways of instruction as the cause of both a lack of enthusiasm and autonomy. As a result, instructors, course designers, and policymakers responsible for the English as a Foreign Language curriculum should personalize textbooks that are appropriate, interesting, relevant, true to the students' actual life, and flexible for usage with technology.

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