

Using Augmented Reality technology to improve English language learning by identifying objects around us

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Educators are expected to be aware of information technology development. However, many teachers have not integrated technology into teaching strategies. This research aims at developing English learning media by using Augmented Reality (AR) technology and analyzed its effectiveness in learning. The researchers employed Microsoft Solution Framework (MSF) tool to develop the media which consisted of requirement definition, and system & software design. The developed media was evaluated through tests to 30 seventh graders of junior high school. Interview and observation were conducted to know users' learning needs. Data was obtained by distributing questionnaires and quantitatively analyzed. The results showed 1) AR-based English media has 12 markers which can be downloaded in the application menu. The application display consisted of pre-elementary, marker, information, and theory pages. The chapter theory included 8 chapters; 2) The mean score of enthusiasm by implementing AR-based media is 27.07, but the score of non-implementing AR-based learning media is 22.33. It can be scientifically stated that AR-based media is effective to increase students' enthusiasm in learning English. The AR technology can potentially be utilized to generate English media in productive skills. Thus, further studies should be encouraged to investigate the integration of English material and AR technology in receptive language skills.



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1. Introduction

English learning is intended to make students having the ability to: (1) develop communication competence both oral and written to gain functional literacy; (2) have consciousness on the essence and importance on English to develop national and global competitiveness; and (3) develop students' understanding on the relationship between nations and culture (Syarifuddin, 2017). The development of students' potency would be focused on making them able to have the communicative competence in the interpersonal, transactional and functional texts (Gultom, 2016; Hargie, 2021). The curriculum puts the priority on scientific approach (observing, questioning, gathering information, associating and communicating), it is supported by other innovative approaches such as problem-based learning, cooperative learning, and explorative learning and so on. Activities in the process of English learning support students to be independent, active in all processes and cooperative with others.

In the syllabus of English learning materials of the seventh graders of junior high school, the subject matters are people, animal or things around the house and school (Wachidah et al., 2017). Identifying things around the house, school and public places should be presented well, this is because the seventh graders are more interested in things if they are displayed with interesting description or display. Students are more motivated to orally deliver the idea through technology (Puspitarini & Hanif, 2019). In this case, AR is used to help students describing things around them, since it is a technology which relates human to machine (Awadh & Shafiull, 2020). Students are expected to have the abilities to describe, identify, criticize and assess people, animal and things from the characteristics. Along with the development of technologies, the Augmented Reality (AR) appears to be one of facilities in the process of teaching and learning at school. The technology of AR is the direct and indirect perspectives from physical things by adding information that can be presented virtually. This technology is presented to support the related learning processes (Czerkawski & Berti, 2021). Technology adopted in the learning media enhances learning outcomes and quality (Marini et al., 2022).

The purpose of learning English is to develop competence on communication both oral and written to gain the functional literacy level. The process of it should include all abilities such as listening, speaking, writing and reading through strategies of language learning. The ability or skill of speaking will support students to deliver idea and feeling in oral. To achieve that, providing the learning media which is information and communication technological based can be an alternative. Research on the role of integrating information technology to learn English has been conducted to improve productive skills. It is stated that information and technology learning based is more valid, effective and practical when it is compared to the non-information and technology learning media based (Endahati & Purwanto, 2016; Tsai et al., 2020). The implementation of information and technology to the learning processes based on the students' needs will develop their interest on English. Media which is integrated with technology is widely implemented in education (Szeto et al., 2016). This research focuses on developing a media of English by using AR technology to describe things around us. AR technology is adopted in several use of practice since it shows the correlation between the real physical world and the digital objects (Poretski et al., 2019; MacCallum & Parsons, 2019). AR means a modern computer-assisted-learning-environment that combines the observed real-world phenomena with graphically added information or image (Norouzifard et al., 2023; Norouzifard et al., 2022). It is revealed by many previous research that high-tech learning based will not bring any significant expectation and goals if that technology does not promote critical thinking, meaning-making or meta-cognition (Saidin et al., 2014; Alam et al., 2019). It is expected that Augmented Reality features are able to engage students in learning processes and help improving their visualization skills.

Augmented reality technology contributes to the ultimate growth of students and supports the development of student's critical thinking (Chang & Hwang, 2018; Rafiq & Hashim, 2018). Besides that, AR technology stimulates pupils to autonomously study the subject matter (Martín-Gutiérrez et al., 2015; Tarasenko et al., 2021; Quqandi et al., 2023). According to research, using augmented reality technology in learning materials results in students becoming more motivated and autonomous (Taskiran, 2019; Wedyan et al., 2022). By providing well-prepared AR teaching materials, the teaching and learning processes would be better conducted and students may get various benefits. This AR technology has been mostly applied in higher education settings and compulsory levels of education for motivating students. Augmented reality technology is adopted to create media in language learning to achieve the learning participants producing the target language autonomously (Parmaxi & Demetriou, 2020; Cai et al., 2022; Marrahi-Gómez & Belda-Medina, 2022). In addition to language instruction, AR technology is used in biology and scientific classrooms (Virata & Castro, 2019; Omurtak & ZEYBEK, 2022; Wang et al., 2023). Students are encouraged to visualize the subject matter through the visualization provided by the AR technology.

By providing well-prepared AR teaching materials, the teaching and learning processes would be better conducted and students may get various benefits. However, teachers met challenges to harness the power of Augmented Reality technology in ways that contribute to the ultimate growth of students, and that means supporting the development of students' higher order thinking skills. Many

obstacles are found in implementing the integration of augmented reality technology in learning. Barriers to implementing augmented reality technology include limited knowledge, limited learning design, limited attention, limited time, and minimal facilities and infrastructure (Mekni & Lemieux, 2014; Alalwan et al., 2020). The general population has a fairly low level of acceptability for the use of augmented reality technologies (Sugiono, 2021). Not everyone, especially educational professionals, is amenable to integrating augmented reality technology, therefore they feel embarrassed about doing so. To guarantee the acceptance of AR to the teaching and learning circumstance, some key points should be carefully considered. They are curriculum, stability of the interaction, self-learning capability, parents' involvement, students' background, platform and social factors (Lasica et al., 2020; Kırılı & Ozen, 2023). Therefore, it is necessary to consider the development of each of these aspects.

While the world is undoubtedly changing, we will grow and adapt along with it. In fact, if we have our way, we will be the ones on the forefront, pushing forward with new innovations and improvements for teaching and learning. As mentioned above, integration of augmented reality technology is needed. A study to test the effectiveness of implementing the AR reveals us that students with adopted AR system have achieved better learning results than those who learned with the traditional 2D simulation system (Satkowski & Dachsel, 2021). It needs for teachers to provide positive emotion and reach learning experiences, not just condensed as 'sightseeing', to stimulate students' active learning (Singer-Brodowski, 2017; Lin et al., 2022). To achieve this, Eco-discovery AR-based learning system (EDALS) was introduced to improve learning outcomes and needs among learners (Huang et al., 2016; Mirza et al., 2022). Without a doubt, infrastructure preparation, curriculum readiness, and active stakeholder involvement assist the integration of technology into the education area, resulting in more advanced education. The implementation of AR technology in language learning can improve the learning outcomes of children (Saputri, 2017; Mubaraq et al., 2018; Rahmawati, 2021). Additionally, technology integrated in English learning is highly influenced by teachers' willingness to keep studying and practicing, students' participation, interaction frequency and cooperativeness (Habibi et al., 2019; Nugroho & Mutiaraningrum, 2020).

English language teaching is directed to students for encouraging them to produce contextual language. There are four basic skills in language competence; listening, speaking, writing and reading. The outcomes of learning English in the *Kurikulum Merdeka* provide an overview of how each language skill is integrated with other skills (Agustini, 2023). The involvement of teachers and students produces good learning collaboration (Anwar et al., 2021; Mora et al., 2020). It is clearly stated in the curriculum of English lesson that has been nationally implemented; the language skills are provided and developed integrative. This integrated language fluency development pushes teachers to change their conventional learning approaches to the ones which are updated and technology based. The ability to understand texts accurately, provide the language model, maintain the fluency, provide model or examples, monitor the target language fluency, and provide time to practice. Texts are better presented through technology integration with teaching media (Christ et al., 2019). This technological implementation has been proven to develop students' level of proficiencies on productive and receptive abilities. As such this Augmented Reality technology, there have been benefits of its' implementation to develop students' achievement on learning.

AR is a novel form of interaction between human and machine which leads to a new experience and perspective. The prominence of AR is that it creates computer animated objects in the real perspective. It uses webcam to detect marker that has been previously designed and project the combination between real and animated objects. The webcam is used as 'eyes' from the technology of AR to detect marker and then process it to generate virtual interaction appears on screen. By implementing the AR technology in learning, it creates effective learning atmosphere which provides us the picture of the real world. The essence is it combines real world situation and virtual objects aims at overcoming problems and understanding learning materials and processes. By implementing it, students have chance to create own understanding and discuss with classmates the teaching materials which implementing the AR in the process. Therefore, this research focuses on the development of English learning media and measures its effectiveness in learning English. The research questions, then are mentioned as follows.

- a. What English learning materials can be developed by using Augmented Reality technology?
- b. How can the developed product (English learning media) effectively improve learning process?

2. Method

2.1. Method of the research

This type of research is survey research which is analytical and descriptive exploratory in nature. In order to test hypotheses, measurement procedures, the clarity of variables, and data based on operational variables and data analyzed using statistical tests, a quantitative approach was used. The effectiveness of using augmented reality technology was assessed using a checklist with a Likert scale.

2.2. Data collection method

Both primary and secondary data were utilized in this study; primary data came directly from the source and took the form of respondents' responses to questionnaire questions that covered various areas of the investigation. The interview with the teacher and school principal was conducted to find out the student's needs. Secondary data on the issues in this study were collected from literature reviews, literary books, journals, and research papers. 32 respondents from SMP PGRI Bantul, including 30 pupils and 2 teachers, made up the study's sample. A total of 32 questionnaires were sent, however only 30 respondents could be tabulated since 2 of the questionnaires were incomplete and hence could not be used in the research.

2.3. Data measurement method

To confirm that the study instrument was a precise and dependable measurement tool, validity (correlation) and reliability tests were conducted. To ascertain the correlation (strength of association) between study variables or to demonstrate the extent to which a measuring instrument measures what it wishes to measure, validity (correlation) tests are conducted. If the significant value is (where $\alpha = 0.05$), then the hypothesis is considered to be valid. The reliability test, also known as internal consistency reliability, measures how consistent a measurement result is when evaluating the same aspect and is assessed using the Spearman method to obtain the r .

2.4. Data analysis method

Multiple regression methods with validity and reliability tests, requirements testing, and multicollinearity, heteroscedasticity, and path analysis (path analysis) tests were all used in the data analysis method that was used to test the proposed hypothesis.

3. Findings and Discussion

The researcher discusses the findings in this part, which are based on questions about the product development of AR-based English learning media and the efficiency of these materials in teaching English to junior high school students in the seventh grade.

3.1. The Product of Learning Media Development

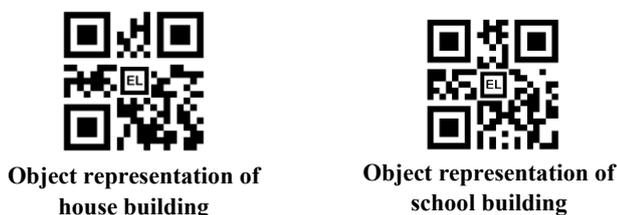
There are 2 vital contents in the application of android based learning media using Augmented Reality technology, they are marker and image display. Marker is an important component in the application of learning media to study English; it is used to display the objects of Augmented Reality in every chapter. It is expected that every user who employs learning media of English lesson to have marker first in which it can be downloaded from the menu of the application. The application has 12 markers in Chapter 1, 2, 4, and 7. Each of them has 1 marker. Moreover, Chapter 3 has 3 markers, 2 markers in Chapter 5 and 2 in Chapter 6. Chapter 8 does not have marker since it presents song for the users. Below is the example of marker in Chapter 3.



Object representation of a clock Object representation of sun Object representation of watch

Figure 1. Markers on Chapter 3

This instructional resource's Chapter 3 contains three markers. These three markers will create 3D representations of wall clocks, watches, and sun-related things. Timing is a key concept covered in Chapter 3 of the work. As a result, the modeled 3D objects include an element of time. Additionally, the 3D graphics shown in other chapters are modified to match the underlying ideas of the subject matter being covered. The items in the home and school are covered in Chapter 5. The markers listed in Chapter 5 are as follows.



Object representation of house building Object representation of school building

Figure 2. Markers on Chapter 5

The display of the application on this English lesson is presented in the first page as a way for users. There is picture provided in the left or right side of the first page. There are 4 menu buttons, they are the button of theory, marker, information and exit. The first button is for connecting the theory to the chapter. The marker button is for connecting the page marker. The information button connects the information on the writers. The last one, exit button is for exiting the program. This application has 8 chapters which helps students to study English from the text books. The theme is adjusted to the text book. Below is the developed 3D objects:

Table 1. The chapter themes

Chapter	Title	3D Object
1	Good Morning, How Are You?	2 students
2	This Is Me	A student
3	What Time Is It?	A clock, sun and a watch
4	This Is My World	Living room
5	It's A Beautiful Day	House and school building
6	We Love What We Do	A cat, a doctor and a deer
7	I'm Proud Of Indonesia	A student
8	That's What Friends are Supposed to Do	

English teachers created the materials to meet the demands of the students. The most engaging and contextual learning materials are those that are connected to items or objects the learner is familiar with. We can get this information from items around your house or at school. The goal of creating English learning resources is to assist students in honing their speaking abilities. The created content utilizes 3D technology and is accessed by markers. Students are encouraged to describe the items they perceive by having access to these objects. Students then refine their speaking abilities. Using media that is incorporated with technology, student may independently produce target language. Expressing ideas fluently initiates student's critical thinking (Iman, 2017). After accessing to the media, students may engage in conversation, debate, and question-and-

answer sessions with their peers. The critical thinking skills of the students was strengthened by this practice. Students in junior high school reach the age when they can start using critical thinking (Bean & Melzer, 2021). By encouraging discussion and problem-solving, this learning tool can improve critical thinking of pupils (Asyari et al., 2016; Narmaditya et al., 2018). Each student took the initiative to solve issues during group discussions.

3.2. Quantitative Data Description

The analysis of product effectiveness is conducted through these hypotheses. The effect of the Augmented Reality technology based for learning media towards the students' enthusiasm. Ho: there is no significant differences on students' enthusiasm between the classes which are taught by employing English Lesson media. Ha: There is significant difference on students' enthusiasm on using English Lesson media. Before testing hypothesis is over, it needs to conduct pre-requisite testing, the normality and the homogeneity testing.

3.2.1. Normality testing

The following table is the result of normality testing.

Table 2. Tests of Normality

Media		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	df	Sig.
Total	non TIK	.229	30	.000	.902	30	.009
	TIK	.185	30	.010	.946	30	.128

a. Lilliefors Significance Correction

Based on the above table, it reveals that the score of Sig. (2-tailed) on the data of students' enthusiasm using non-English Lesson media has significance $< 0,05$, so that the Ho is acceptable. This means the data is not normal distributed. Furthermore, the data of students' enthusiasm using English Lesson media application has significant $< 0,05$, meaning that Ho is acceptable and data is not normal distributed.

3.2.2. Homogeneity testing

The following table is the result of homogeneity testing

Table 3. Test of Homogeneity of Variances

Total			
Levene Statistic	df1	df2	Sig.
.683	1	58	.412

Based on the above table, the significant score on students' enthusiasm is above 0,05, that is 0,412. It can be concluded that in the level of significant 5%, group that is employed in this research is the homogeny group.

3.2.3. Hypothesis testing

The following table represents the summary on output Mann-Whitney students' enthusiasm on the class which implements the English Lesson Application.

Table 4. Test Statistic^s

	Total
Mann-Whitney U	2.000
Wilcoxon W	467.000
Z	-6.678
Asymp. Sig. (2-tailed)	.000

Based on the above illustration, it can be revealed that the achievement significant score is 0,000. The score is <0,05 which leads Ho is refused. There is difference between classes which implements the AR based English Lesson with the one which does not.

3.2.4. Mean testing

Table 5. Report

Total			
Media	Mean	N	Std. Deviation
non AR	19.29	30	1.093
AR	26.18	30	1.413
Total	22.73	60	2.695

Based on quantitative descriptive analysis, it can be concluded that mean enthusiasm by employing AR technology-based for English Lesson media is 26.18. Meanwhile, the score of enthusiasm by using non-media application English Lesson is 19.29. It can be declared that using application English Lesson media based on AR is effective to develop students' enthusiasm to study and learn English by identifying things around us. We can use talks, question-and-answer sessions, games, or even writing to identify objects. Students might begin the activity with a guessing game before moving on to discussing the features of the objects visible in the 3D model. Students who are passionate on studying tend to be joyful and engaged in all aspects of the educational process (Anderson, 2016). Bright and energetic facial expressions convey feelings of excitement. Students concentrate on the subject matter they are learning. The pupils are also engaged and receptive to the teacher's guidance. They actively participate in responding to inquiries, expressing ideas, and holding debriefings that are connected to critical thinking (Cicchino, 2015).

4. Conclusion

This research generates learning media, namely the application of English Lesson, consists of 8 chapters. The display of the application consists of first page, marker page, information page and the theory page of the chapter. The users can use this media need to download the 12 markers. Mean enthusiasm by using non-English Lesson media application is 19.29. The score of enthusiasm by implementing the application of English Lesson is 26.18. It leads to a conclusion that AR is effective to develop students' enthusiasm to study things around in English. The findings of this study demonstrate that augmented reality technology can potentially be utilized to generate teaching materials for English. The developed learning materials focuses on increasing productive skills. Thus, further researchers are expected to investigate the effectiveness of integrated English learning media and AR technology in receptive language skills.

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Declarations

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