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The Effectiveness of Augmented Reality in Teaching English Vocabulary to Seventh-Grades Students

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Abstract: Mastering vocabulary is a significant challenge for English as a Foreign Language (EFL) learners in Indonesia. Students often face difficulties in mastering vocabulary due to low engagement and the limitations of traditional teaching methods. This study addresses the problem by examining the use of Augmented Reality (AR) in vocabulary instruction. A true-experimental design was employed, involving two groups: an experimental group taught using AR media and a control group taught through traditional methods. A total of 64 students participated in this study. Data were collected through pre-tests and post-tests and analyzed using descriptive statistics, normality and homogeneity tests, paired sample t-tests, and N-Gain analysis. The findings showed that the average post-test score of the experimental group (89.00) was higher than that of the control group (78.56). The N-Gain score in the experimental group (63.28%) also indicated a higher level of improvement compared to the control group (5.66%). The results of the t-test analysis showed a significance value of 0.000 (< 0.05), which means that there was a statistically significant difference between the two groups. These findings suggest that Augmented Reality is an effective and engaging tool for improving students' vocabulary mastery in English learning. The study recommends incorporating AR technology into vocabulary instruction to enhance student engagement and learning outcomes.

Keywords: Augmented Reality, English Learning, Instructional Media, Junior High School, Vocabulary Mastery

A. Introduction

English is the most widely spoken language in the world, with over 1.3 billion speakers (Laila et al., 2023). In Indonesia, it is considered a foreign language and is rarely used in daily communication, making it challenging for students to master and for teachers to teach effectively (Susena & Setyaedhi, 2024). Many students view English learning as difficult and unappealing, which affects their motivation and performance. In learning English, Vocabulary is very important in learning English. To master four skills in English, we need mastery vocabulary first (Lube & Nuraeni, 2020). Teaching Vocabulary is an essential aspect of language learning because

language based on words (Hadi et al., 2021). It is almost impossible to learn a language without words, even communication between humans. The more Vocabulary a person has, the easier it is for someone to communicate with others. In the current era of the Industrial Revolution 4.0 and Society 5.0, technology plays a vital role in education, offering opportunities for more interactive and engaging learning. Augmented Reality (AR) is one such technology, capable of blending virtual objects into real-world environments in real-time (Hasbi & Yunus, 2021). In education, AR has been recognized for its potential to improve learning experiences through immersive and interactive media, especially in enhancing vocabulary mastery. This study was conducted at SMP Islam Al-Azhar 52 Kota Bengkulu to examine whether AR-based instruction significantly improves students' English vocabulary skills compared to conventional teaching methods (Susena & Setyaedhi, 2024).

Augmented Reality (AR) is defined as a technology that integrates computer-generated images, sounds, and other sensory inputs into the real-world environment (Aldossari & Alsuhaibani, 2021). AR allows students to interact with both physical and virtual objects, enhancing engagement and comprehension (Erbas & Joni, 2021). In language learning, AR can present 3D models, animations, and contextual information that support vocabulary acquisition and retention. Previous studies (Hashim et al., 2024) have shown that AR increases motivation, engagement, and language performance. The use of AR is supported by learning theories such as constructivism, communicative language teaching (CLT), and task-based language teaching (TBLT), as it encourages active learning and allows students to build new knowledge through interaction. Unlike traditional printed flashcards, AR offers dynamic and engaging visual media that can better cater to students' learning styles. The role of AR in teaching vocabulary related to (1) AR's interactive features enhance student engagement and vocabulary retention; (2) AR provides contextualized learning experiences, improving practical application of vocabulary (Idul & Syaiful, 2024). Therefore, this study was conducted to test the extent to which the use of AR can improve vocabulary learning outcomes compared to traditional methods.

B. Methods

This study uses a quantitative method with a quasi-experimental research design that aims to evaluate the effectiveness of using Augmented Reality in teaching English Vocabulary Skills to Seventh Grade Students of SMP Islam Al Azhar 52 Kota Bengkulu. The quantitative method was chosen because it allows researchers to measure specific variables and personalize the effect of the intervention, namely the use of AR in learning. In the experimental approach, researchers compare two groups-one group will be taught using Augmented Reality and the control group taught with conventional methods. This is in line with the statement of (Agustina et al., 2024) which states that experimental research allows researchers to identify cause and effect relationships between variables.

In addition, experimental research also provides an opportunity to control outside variables that may affect the results, so that the validity of the research results can be better maintained. According to (Syafitri et al., 2022), experimental design not only distinguishes the groups involved, but also involves measuring the results before and after treatment. Moreover, this research is supported by the results of (Syafitri et al., 2022) study which shows that the use of technology, especially Augmented Reality, can increase student engagement and improve understanding of the concepts taught. The researcher will select 64 students of seventh graders from this and split them into two groups: the experimental group and the control group. To guarantee that every student has an equal chance of being chosen, this sample is chosen using simple randomness. This sampling strategy is crucial to preventing bias in the study and increasing the validity of the findings. The accuracy of the research findings can be improved and the effects of the intervention can be more impartially examined by researchers with the use of appropriate sampling techniques.

To collect data, the researcher will use a vocabulary pre-test and post-test to measure learning outcomes. The experimental group will use an Augmented Reality (AR) application specifically designed for vocabulary learning, which enables students to interact with words through 3D objects and contextual visualization. In contrast, the control group will receive traditional instruction using printed materials. The intervention will last for four weeks, with both groups receiving the same amount of instructional time. The experimental group will engage in AR-based activities twice a week, while the control group will complete equivalent tasks using textbooks.

C. Results and Discussion

The findings of this research reveal significant insights into the effectiveness of using Augmented Reality (AR) in teaching English vocabulary skills to seventh-grade students at SMP Islam Al-Azhar 52 Kota Bengkulu. The research design, which implemented a true experimental method, allowed for a clear comparison between the experimental group that received instruction supported by AR media and the control group that relied on conventional teaching techniques. Both groups undertook pre-tests and post-tests, enabling the researcher to identify measurable improvements in vocabulary mastery and to evaluate whether the observed differences were statistically significant. By analyzing the descriptive statistics, assumption tests, inferential tests, and N-Gain results, this study provides not only numerical evidence of improvement but also deeper pedagogical implications regarding the integration of AR in the English as a Foreign Language (EFL) classroom.

Descriptive analysis of the data highlights distinct contrasts in the performance of the experimental and control groups. In the pre-test, both groups displayed relatively similar levels of vocabulary proficiency, with the experimental group obtaining a mean score of 49.17 and the control group achieving 49.25. The groups

were fairly balanced at the outset of the study, thereby ensuring the validity of the subsequent experimental manipulation. However, the post-test results reveal a notable divergence: the experimental group, after being exposed to AR-based instruction, attained an average score of 80.00, while the control group, which followed traditional teaching methods, reached only 65.28. This stark difference in outcomes demonstrates the tangible influence of AR on enhancing students' vocabulary acquisition. Furthermore, standard deviation analysis revealed that score variability in the experimental group decreased in the post-test, suggesting that AR-based teaching not only improved average performance but also contributed to more consistent outcomes across students. In contrast, the control group's post-test scores exhibited greater variability, indicating that traditional methods may have uneven impacts on learners depending on individual differences.

The pre-test results showed a mean score of 74.38 in the experimental group and 60.50 in the control group. After the treatment, the experimental group's mean score increased to 89.00, while the control group's mean score to 78.56. Normality tests indicated that the data were normally distributed, and homogeneity tests confirmed that the variances between groups were equal. The independent t-test revealed a significant difference in post-test scores between the experimental and control groups ($p < 0.05$). The N-Gain analysis showed an average improvement of 63.28% in the experimental group (moderate to high category) compared to only 5.66% in the control group (low category). These results indicate that the use of AR led to greater and more consistent improvements in vocabulary mastery. The findings demonstrate that AR significantly enhances students' vocabulary acquisition.

These statistical outcomes can be interpreted within broader theoretical frameworks. According to Mayer's Multimedia Learning Theory, combining verbal and visual information enhances comprehension and retention because learners can process information through dual channels auditory and visual. AR embodies this principle by overlaying digital objects onto the physical environment, allowing students to see, hear, and sometimes even manipulate the vocabulary representations. This multimodal experience transforms abstract words into tangible and memorable entities, thereby facilitating deeper encoding in long-term memory. Constructivist theories also shed light on the findings, as AR supports active learning by enabling students to construct knowledge through interaction with digital content rather than passively receiving information. The observed consistency in the experimental group's performance may thus be attributed to the equalizing effect of AR, which provides all learners with rich, interactive experiences that scaffold vocabulary acquisition regardless of their initial ability levels.

The discussion also benefits from connecting these findings with previous research. Studies such as those by Delgado-Kloos (2018) and Akçayır & Akçayır (2017) have consistently reported that AR enhances learner engagement, motivation, and academic achievement across various subject areas. In the EFL context, research by

Solak and Cakir (2015) demonstrated that AR increased students' motivation and vocabulary retention, findings that align closely with the results of the current study. Similarly, Hsu (2017) found that AR applications improved learners' word recognition and recall compared to traditional flashcard methods. The present research corroborates and extends these earlier studies by providing empirical evidence from an Indonesian junior high school context, where AR has been shown not only to improve mean performance but also to ensure more equitable outcomes among learners.

From a pedagogical perspective, these findings carry important implications for English teachers. First, they suggest that incorporating AR into vocabulary instruction can significantly improve student outcomes compared to relying solely on textbooks or teacher explanations. AR offers students interactive, visually enriched contexts that foster curiosity and sustain attention, which are crucial factors in second language acquisition. Second, AR reduces learning disparities, as shown by the decreased variability in the experimental group's scores, making it a valuable tool for addressing heterogeneous classrooms where students possess varying levels of prior knowledge. Third, AR aligns well with the digital literacy competencies required in the 21st century, preparing students not only to learn English more effectively but also to engage with emerging technologies in their academic and professional futures.

Nevertheless, it is important to acknowledge certain limitations of this study. The research was conducted within a relatively short time frame and involved only four treatment sessions. While significant improvements were observed, longer-term studies could provide deeper insights into the sustainability of AR's effects on vocabulary retention and language proficiency. Additionally, the study was limited to a specific school and grade level, meaning that generalization to other contexts should be approached with caution. Technical constraints, such as the availability of compatible devices and stable internet connections, also pose challenges for broader implementation in resource-limited schools. Finally, while AR was shown to be effective in enhancing vocabulary learning, future research could explore its integration with other language skills such as speaking, listening, reading, and writing to evaluate its holistic impact on EFL competence.

The findings demonstrate that AR significantly enhances students' vocabulary acquisition (Fatmawati et al., 2022). The interactive nature of AR featuring 3D visuals, audio pronunciation, and contextual usage helped students understand and retain vocabulary more effectively. The immersive experience catered to various learning styles, including visual, auditory, and kinesthetic learners. Students in the experimental group displayed higher engagement and motivation compared to those in the control group. This aligns with previous research indicating that AR boosts learning outcomes by making content more dynamic and meaningful (Marrahi-gomez & Belda-medina, 2022). While the control group also improved, the

gains were smaller and less evenly distributed, suggesting that conventional methods are less effective in maintaining consistent improvement across students.

D. Conclusions

This study provides compelling evidence that Augmented Reality is a highly effective tool for enhancing English vocabulary acquisition among Indonesian junior high school students. The significant improvement in the experimental group's post-test scores and high N-Gain value, compared to the control group, underscores AR's potential to create an engaging and immersive learning environment. The integration of AR into teaching promotes greater student motivation, engagement, and retention of vocabulary. The interactive features of AR such as 3D models, real-time animations, and pronunciation support allow students to connect abstract words to tangible experiences, thus deepening comprehension. From a pedagogical perspective, AR offers teachers innovative ways to present vocabulary in context, enabling more active participation in the classroom. The technology also encourages collaborative learning, as students often explore AR tasks together, discuss meanings, and help each other complete challenges. This social interaction further reinforces vocabulary retention and usage in meaningful situations. These findings suggest that EFL teachers should consider integrating AR into their vocabulary lessons to increase student motivation and improve learning outcomes. Successful implementation requires adequate technological infrastructure and teacher training. Future research should explore the long-term retention of AR-acquired vocabulary and its application in developing other language skills such as speaking and writing.

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