UTILIZING MOBILE AUGMENTED REALITY APPLICATION FOR VOCABULARY ACQUISITION IN ENGLISH LANGUAGE LEARNING

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Abstract: This study explores the impact of mobile augmented reality (AR) applications, specifically Google Lens, on vocabulary acquisition in English language education. Vocabulary is vital for language proficiency, and AR offers an interactive learning experience superior to traditional methods. Limited research exists on AR's role in vocabulary development among secondary students, emphasizing this study's importance. An explanatory sequential mixed-methods approach was used, beginning with a quantitative survey of 30 eighth-semester students from Universitas Islam Malang, followed by qualitative interviews with four participants based on their survey performance. The quantitative analysis revealed a weakly positive but statistically insignificant correlation ($r = 0.082$, $p = 0.666$) between perceptions of mobile AR and vocabulary acquisition. However, high average vocabulary scores (mean 101.50/135, SD 8.23) were noted. Qualitative findings highlighted the positive impact of Google Lens on motivation, comprehension, and learning experiences, with real-time feedback and accessibility enhancing vocabulary learning. Despite insignificant quantitative results, qualitative insights reveal the educational value of mobile AR. This study underscores the need to combine quantitative and qualitative approaches to fully grasp AR's impact on language learning, suggesting mobile AR applications like Google Lens can significantly enhance vocabulary acquisition, providing valuable insights for educators and future research.

Keywords: Vocabulary Acquisition, Mobile AR Applications, Digital Learning Tools

INTRODUCTION

The transformative influence of technology is evident in contemporary English language education, particularly through mobile augmented reality (AR) applications. This study investigates how mobile AR, specifically Google Lens, enhances vocabulary acquisition. Medina and Gomez (2023) describe AR as technology that overlays digital content onto the real-world environment, creating immersive experiences. Vocabulary acquisition, a cornerstone of language proficiency, benefits from such innovative tools, as highlighted by Rezaei et al. (2014), who found mobile applications to be highly effective for learners.

Mobile applications, commonly referred to as mobile apps, are popular aids in the digital age. Google Lens, with its AR features, integrates virtual elements with real-world settings, providing an interactive learning experience (Medina & Gomez, 2023). This study employs

Google Lens to explore its effectiveness in enhancing vocabulary acquisition among English as a Foreign Language (EFL) students. The immersive nature of AR applications offers a significant advantage over traditional learning methods, fostering a more engaging and personalized learning environment.

Extensive research supports the pivotal role of vocabulary in effective communication and language proficiency. According to Lu et al. (2023), vocabulary is crucial for expressing diverse ideas and meanings, even for learners with good pronunciation and grammar. Despite the growing literature on AR in language learning, Medina and Gomez (2023) note a scarcity of research on its effectiveness for vocabulary development among secondary students. This study aims to address this gap by examining the impact of mobile AR applications on vocabulary acquisition, focusing on students' experiences and perceptions.

The integration of mobile AR applications in education aligns with modern learners' preferences for personalized and immersive experiences. This study investigates the dynamic intersection of AR technology and language learning, particularly through the use of Google Lens. Insights from this research can refine language education practices, ensuring they meet the evolving needs of students in a technology-driven era.

Beyond academic implications, this study highlights the global importance of English proficiency. As noted by Albadri et al. (2022), vocabulary learning poses challenges, especially for non-native speakers. Integrating mobile AR applications into vocabulary learning presents a strategic approach to overcoming these challenges. This research contributes to enhancing language education strategies and serves as a pathway for future research, aiming to harness the full potential of AR technology in education. The findings will offer valuable insights for educators and institutions seeking innovative approaches to language learning in the digital age.

METHODS

This study employs an explanatory sequential mixed-methods approach to investigate the correlation between EFL students' perceptions regarding mobile Augmented Reality (AR) utilization and their vocabulary acquisition, as well as to explore students' perceptions of the effectiveness and utility of mobile AR applications for vocabulary acquisition in English language learning. The research design, based on Creswell (2012), begins with a quantitative phase followed by a qualitative phase to provide comprehensive insights into the research questions.

The population for the quantitative phase consists of eighth-semester students at Universitas Islam Malang, specifically targeting those with experience using mobile AR applications, such as Google Lens, for vocabulary acquisition. A sample of 30 participants will be

selected through purposive sampling to ensure that they have actively used the technology and represent diverse academic standings. This approach aims to capture a representative group that can provide nuanced insights into the impact and effectiveness of mobile AR applications for vocabulary acquisition, thereby contributing to the robustness of the study.

In the qualitative phase, four participants will be selected based on their quantitative phase scores. Two with the highest scores and two with the lowest scores. These participants will be chosen based on their willingness to participate in in-depth interviews and complete open-ended questionnaires. This smaller, focused group will provide valuable qualitative data, offering deeper insights into their experiences with mobile AR applications for vocabulary acquisition.

The study utilizes two key research instruments in the quantitative phase: a close-ended questionnaire and vocabulary acquisition mastery scores. The questionnaire, structured on a 5-point Likert scale and comprising 20 items, will capture EFL students' perceptions of mobile AR use for vocabulary learning. This instrument, adapted from Razaei et al. (2014), is designed to measure satisfaction and perceptions of the impact of mobile AR technologies on English vocabulary acquisition. Concurrently, participants' proficiency levels in vocabulary acquisition will be evaluated using their scores from the Test of English Proficiency (TEP), focusing on listening and reading sections.

For qualitative data collection, an interview instrument consisting of 10 questions has been developed to delve into students' perceptions of the effectiveness of mobile AR applications for vocabulary acquisition. The interviews, conducted via online calls and lasting around 30 minutes, will allow students to express their thoughts and experiences in an open-ended format. The qualitative data will complement the quantitative findings, providing a richer, more contextualized understanding of students' perspectives.

Data collection for the quantitative phase involves administering the close-ended questionnaire and gathering vocabulary acquisition mastery scores in a controlled environment. The questionnaire will be distributed among EFL students with clear instructions, and participants will be encouraged to provide honest feedback. Vocabulary acquisition scores will be obtained from existing records of the TEP, ensuring synchronization and accuracy in data collection. Quality assurance measures will be rigorously adhered to maintain the reliability and validity of the collected data.

In the qualitative phase, semi-structured interviews will be recorded to ensure accuracy in capturing students' genuine sentiments. This approach aims to provide a deeper understanding of the factors influencing students' perceptions and satisfaction with mobile AR applications for vocabulary acquisition. The thematic analysis of interview transcripts will identify recurring

themes and patterns, offering qualitative insights into the effectiveness of mobile AR applications for vocabulary acquisition.

Quantitative data analysis will involve the use of Pearson correlation coefficient and descriptive statistics, performed using SPSS 26.0. The Pearson correlation will assess the strength and direction of the relationship between students' perceptions of mobile AR use and their vocabulary acquisition. Descriptive statistics will summarize the central tendencies and variability of responses on the questionnaire and vocabulary acquisition scores. Likert scale data will be converted into subscale scores to standardize the evaluation of mobile AR's impact on vocabulary learning. Concurrently, qualitative data will be analyzed through thematic analysis of semi-structured interview transcripts. This analysis will identify recurring themes, patterns, and nuanced perspectives to provide a deeper understanding of students' experiences and perceptions of mobile AR applications for vocabulary acquisition. By integrating both quantitative and qualitative findings, the study aims to offer a comprehensive view of how mobile AR influences vocabulary learning.

To ensure the trustworthiness and triangulation of the study, several strategies will be employed. These include using multiple data sources for cross-verification, providing detailed descriptions of the research context, maintaining an audit trail, and minimizing researcher biases through reflection and peer debriefing. These measures will enhance the credibility, transferability, dependability, and confirmability of the findings, contributing to the overall rigor of the research.

This explanatory sequential mixed-methods study aims to provide a well-rounded exploration of the impact of mobile AR applications on EFL students' vocabulary acquisition experiences. By integrating quantitative and qualitative data, the research will offer comprehensive insights into the effectiveness and utility of mobile AR applications in English language learning, contributing to the broader understanding of technology-enhanced language education.

FINDING AND DISCUSSIONS

Validity and Reliability

The study rigorously evaluated the validity and reliability of its measurement instrument using a sample of 30 participants. To assess validity, the Pearson correlation method was employed. According to the r-table value of 0.361 (Chaniago, 2010), an item is considered valid if its calculated r-count exceeds this threshold. The analysis revealed that all items on the instrument had r-values ranging from 0.567 to 0.787, indicating that each item exceeded the r-table value and thus was deemed valid. For reliability, the study utilized Cronbach's alpha, a measure of internal

consistency. With a Cronbach's alpha value of 0.939, significantly higher than the critical threshold of 0.7, the instrument demonstrated high reliability, ensuring that the results are dependable and consistent across repeated measures.

Item	R-value	R-table	Conclusion	Cronbach's Alpha	Critical Point	Conclusion
Q01	0.764	0.361	Valid	0.939	0.7	Reliable
Q02	0.718	0.361	Valid			
Q03	0.787	0.361	Valid			
Q04	0.612	0.361	Valid			
Q05	0.662	0.361	Valid			
Q06	0.567	0.361	Valid			
Q07	0.746	0.361	Valid			
Q08	0.708	0.361	Valid			
Q09	0.623	0.361	Valid			
Q10	0.690	0.361	Valid			
Q11	0.705	0.361	Valid			
Q12	0.612	0.361	Valid			
Q13	0.598	0.361	Valid			
Q14	0.612	0.361	Valid			
Q15	0.687	0.361	Valid			
Q16	0.681	0.361	Valid			
Q17	0.785	0.361	Valid			
Q18	0.682	0.361	Valid			
Q19	0.737	0.361	Valid			
Q20	0.704	0.361	Valid			

Quantitative Finding

Correlational Analysis

The quantitative analysis aimed to explore the relationship between EFL students' perceptions of mobile augmented reality (AR) applications and their vocabulary acquisition success. The Pearson correlation coefficient (r) was calculated to measure the strength and direction of this relationship, yielding a value of 0.082. The corresponding p-value of 0.666 was notably higher than the significance threshold of 0.05, indicating that the observed correlation was not statistically significant. This suggests that the relationship between students' attitudes towards mobile AR tools and their success in vocabulary acquisition is weak and not substantial enough to be deemed significant in this study.

		Total score questionnaire	Total score vocabulary acquisition
Total score questionnaire	Pearson Correlation	1	0.082
	Sig. (2-tailed)		0.666
	N	30	30
Total score vocabulary acquisition	Pearson Correlation	0.082	1
	Sig. (2-tailed)	0.666	
	N	30	30

Descriptive Analysis

Descriptive statistics provided insights into participants' responses regarding the effectiveness of mobile AR tools. Questionnaire responses were converted to a 0-100 scale to facilitate comparison, with mean scores averaging around 68.33 for various effectiveness aspects such as enjoyment and stress reduction. The median scores frequently reached 75, indicating that many participants rated their experiences with AR tools positively. Additionally, vocabulary acquisition mastery scores ranged from 65 to 135, with a mean score of 101.50 and a standard deviation of 8.23. These statistics indicate a generally high level of vocabulary proficiency among participants, with moderate variability in scores.

Qualitative Findings

Enhanced Understanding of Vocabulary

Qualitative data from semi-structured interviews revealed that participants perceived significant benefits from using Google Lens and AR applications in enhancing their understanding of vocabulary. The tools provided instant translations, pronunciation assistance, and visual aids that facilitated the comprehension of complex texts. One participant noted, “When reading an article with high language that I don't understand, I use Google Lens AR to understand the content. It helps me find new vocabulary and listen to the pronunciation directly” (Student 1). The pronunciation feature was particularly appreciated, with students highlighting its role in aiding vocabulary memorization.

Increased Interest and Motivation

Participants reported increased interest and motivation in learning English vocabulary due to the interactive and engaging elements of Google Lens and AR tools. The tools' visual representations and instant feedback made learning more appealing and less monotonous compared to traditional methods. “These tools make learning vocabulary more interesting. The visual representation of words helps in better memorization and makes the process more engaging” (Student 2). The instant feedback provided by these tools was also cited as a factor that reduced learning anxiety and maintained motivation.

Improved Retention and Recall

The use of Google Lens was found to significantly enhance vocabulary retention and recall. Participants noted that vocabulary learned through AR tools was retained longer compared to traditional methods. The visual aids associated with vocabulary were particularly effective in reinforcing memory. As one participant mentioned, “Learning new words through this method has resulted in me remembering them for a longer time. The words memorized by Google Lens stick

better compared to traditional methods" (Student 3). The ability to associate words with images and videos was cited as a key factor in improving recall.

Accessibility and Convenience

Participants valued the ease of use and portability of Google Lens and AR applications, which allowed for vocabulary learning at any time and from any location. The tools' convenience was highlighted as a major advantage over traditional classroom-based learning. "The technology is fascinating because it's fast, simple, and instant. You just take a picture of the text, and the AI translates it right away" (Student 4). This accessibility enabled students to integrate vocabulary learning into their daily routines more seamlessly.

Effectiveness Compared to Traditional Methods

While traditional methods of vocabulary learning were acknowledged, participants found Google Lens and AR applications to be more effective in certain aspects. The immediate and accurate translations provided by these tools were considered superior to conventional methods. "Google Lens is far superior in vocabulary acquisition. You can just take a picture of an object and instantly know what it means" (Student 4). However, some participants emphasized that these tools should complement rather than replace traditional learning methods, highlighting the need for a balanced approach.

Challenges and Difficulties

Despite the benefits, participants encountered several challenges with Google Lens and AR applications. Issues with handwriting recognition and the need for accuracy verification were noted as areas for improvement. For example, one participant experienced difficulties with translating handwritten texts: "If I try to translate English from human handwriting, errors occur because the system cannot verify words correctly due to unclear writing" (Student 3). Additionally, some participants suggested that translations should be double-checked for accuracy.

Suggestions for Improvement

Participants offered valuable suggestions for enhancing the functionality of Google Lens and AR applications. Enhancements such as improved handwriting recognition and additional features were recommended to further support vocabulary learning. For instance, one participant suggested, "Maybe Google Lens could offer a suggested list of similar objects after taking a picture. This way, you can learn not just one vocabulary word but multiple related ones" (Student 4). Improvements in scanning and recognition capabilities were also emphasized to increase the tool's effectiveness.

Integration of Quantitative and Qualitative Findings

The integration of quantitative and qualitative findings provides a comprehensive understanding of the relationship between EFL students' perceptions of mobile AR use and their vocabulary acquisition. While the quantitative analysis showed a weak and statistically insignificant correlation, the qualitative data highlighted significant benefits and positive experiences with AR tools. The qualitative insights offer a deeper understanding of how these tools impact learning beyond what is captured by numerical measures alone. The combination of these data types underscores the complexity of the relationship between technology and learning outcomes.

Integration of Quantitative and Qualitative Findings

The synthesis of quantitative and qualitative findings provides a comprehensive understanding of the relationship between EFL students' perceptions of mobile AR use and their vocabulary acquisition. While the quantitative analysis showed a weakly positive but not statistically significant correlation, the qualitative data offered deeper insights into students' experiences and perceptions. Participants consistently rated AR tools highly for their effectiveness, enjoyment, and reduced stress in vocabulary learning. The qualitative data highlighted the interactive and engaging nature of mobile AR applications, enhancing comprehension and motivation among students. This integrated approach underscores the importance of combining quantitative and qualitative research to fully understand the complexities of the phenomenon studied.

Discussions

This study explored the use of mobile augmented reality (AR) applications, such as Google Lens, in enhancing vocabulary acquisition among English as a Foreign Language (EFL) students, revealing both qualitative and quantitative insights. Our findings show a weak positive correlation between students’ attitudes toward AR and their vocabulary acquisition, which was not statistically significant. Despite this, descriptive analysis indicated high ratings for AR tools' effectiveness, suggesting their perceived utility in learning new vocabulary, increasing enjoyment, and reducing stress, aligning with prior research (He et al., 2014; Chen & Chan, 2019).

Qualitative feedback emphasized AR applications' interactive and engaging nature, which significantly improved students' comprehension and motivation, consistent with He et al. (2014) and Chen et al. (2018). Although the qualitative findings resonate with these studies, our quantitative results did not demonstrate a statistically significant correlation between AR

perceptions and vocabulary improvement. This suggests that while AR tools are well-received and enjoyable, their direct effect on measurable vocabulary acquisition may be limited.

Chen & Chan (2019) found that AR flashcards were as effective as traditional flashcards, a result supported by our study's qualitative feedback indicating high effectiveness of AR tools. However, the lack of significant correlation in our quantitative analysis points to the need for further investigation into additional factors influencing vocabulary acquisition through AR. Tsai (2020) reported significant improvements in students' post-test scores using AR, reflecting high preferences for AR in learning. While our study supports these preferences, the discrepancy between qualitative and quantitative results highlights the need to explore how AR affects learning outcomes beyond engagement.

Binhomran & Altalhab (2021) and Bursali & Yilmaz (2019) observed benefits in vocabulary acquisition and motivation with AR, though these were not statistically significant. Our findings echo these results, showing positive student perceptions of AR but an insignificant correlation with vocabulary acquisition. This implies that while AR may enhance the learning experience, its direct impact on vocabulary growth is not yet conclusive. According to Khan et al. (2023) found mixed results regarding AR's effectiveness in vocabulary learning, with qualitative data revealing some positive impacts. Our study aligns with this, highlighting that while students appreciated AR's interactive nature, the quantitative correlation with vocabulary improvement was not significant. This suggests that AR's benefits might be more qualitative, improving the learning experience rather than producing immediate, measurable vocabulary gains.

The study's limitations include reliance on self-reported data, which can be subjective and prone to response bias, and the specific context of the University of Islam Malang, which may not be generalizable to other settings. These constraints underscore the need for caution in interpreting the findings and suggest directions for future research. Future studies should investigate the long-term effects of mobile AR applications on vocabulary acquisition and language proficiency, employing larger and more diverse sample groups. A multidisciplinary approach, integrating linguistics, cognitive science, and educational technology, could offer deeper insights into AR's educational impact and address the limitations observed in this study.

CONCLUSIONS AND SUGGESTIONS

This study aimed to explore the impact of mobile augmented reality (AR) applications on vocabulary acquisition among English as a Foreign Language (EFL) students, focusing on their perceptions and the effectiveness of these tools. While the quantitative analysis revealed no statistically significant relationship between students' perceptions of AR applications and their

vocabulary acquisition, qualitative findings underscored the substantial educational value of these tools. Participants reported that Google Lens, in particular, facilitated a deeper understanding of vocabulary, provided instant feedback, and significantly increased their motivation to learn. The convenience and accessibility of AR applications offered a dynamic alternative to traditional learning methods, enabling students to engage with vocabulary learning anytime and anywhere.

The integration of both quantitative and qualitative data in this study provided a holistic view of mobile AR applications' impact. Although the quantitative results did not demonstrate a significant effect, the qualitative data highlighted the real-world benefits of AR technology in enhancing student engagement and providing immediate feedback. These insights challenge the notion that positive perceptions alone guarantee effective learning outcomes, suggesting that while perception is important, it is the actual use and functionality of the tools that matter most.

To maximize the effectiveness of mobile AR applications in language learning, several recommendations emerge. Teachers are encouraged to integrate these technologies into their teaching strategies, as their interactive nature can boost student motivation. Professional development and training on AR applications will be beneficial for educators to optimize these tools in the classroom. Additionally, soliciting student feedback can help in refining the use of AR applications.

Students are advised to independently explore and utilize AR applications to enhance their vocabulary learning. The self-directed use of these tools, coupled with reflection on their learning experiences, can help students better manage their learning process and provide valuable feedback to educators. Engaging with AR applications can foster greater autonomy and control over one's learning journey.

Future research should focus on the long-term effects of mobile AR applications on vocabulary acquisition and language skills. Expanding sample sizes and investigating which specific features of AR applications have the most significant impact on learning outcomes will be crucial. Additionally, combining AR technology with other scientific or linguistic content could provide further insights into its effectiveness in language education, addressing the limitations and biases identified in this study.

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