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Students' Experiences on Implementation of Augmented Reality Material in Islamic Boarding School to Improve Students' Vocabulary

Fitrah Amalia Sofyan[1], Masruddin[2], Sukirman[3]
[1,2,3]Tadris Bahasa Inggris, State Islamic Institut of Palpo, Palopo, South Sulawesi

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Corresponding Author:
Fitrah Amalia Sofyan
2205040011@uinpalopo.ac.id
Tadris Bahasa Inggris, State Islamic Institut of Palpo, Palopo, South Sulawesi

Abstract

This study aims to investigate the use of Augmented Reality (AR) in enhancing English vocabulary learning among students in an Islamic boarding school (pesantren) context. The research was conducted at Islamic boarding school on Palopo using a qualitative case study approach. The participants consisted of six female students aged 12–17 who were selected based on their active participation in English learning activities. The study utilized Octagon Company AR flashcards as the primary learning media. Data were collected through classroom observations and semi-structured interviews and were analyzed using thematic analysis. The findings reveal three main themes: (1) enhanced vocabulary retention, (2) increased learning motivation, and (3) implementation challenges in the pesantren environment. The use of AR significantly improved students' vocabulary acquisition, as indicated by an average assessment score of 81.93, and increased their engagement through interactive and visual learning experiences. However, challenges such as limited access to devices, internet restrictions, and institutional rules in pesantren were identified as barriers to implementation. This study suggests that AR has strong potential as an innovative tool for English language learning in traditional educational settings. It is recommended that pesantren administrators and educators consider integrating AR-based learning with appropriate technological support and policy adjustments to maximize its effectiveness while maintaining institutional values.

1. Introduction

English is currently a language that needs to be mastered in the era of globalization, which is increasingly advanced and is breaking down borders between countries. The disappearance of borders between countries makes it possible for people to communicate with foreigners from various countries, and they need a language that can unite people. English plays a role as an international language and also a *lingua franca*. It is supported by data from Statista in 2023 that English is the first most popular language in the world, with 1,456 million speakers both as native speakers and as a second language.

As the most popular language in the world, most countries use English as a lesson in school. In the Indonesian context, pesantren (Islamic boarding schools) represent a unique educational environment where religious values are prioritized alongside formal education. In many pesantren, the use of technology, including smartphones and internet access, is often limited due to institutional regulations. This creates both opportunities and challenges for integrating modern educational technologies such as Augmented Reality (AR) into the learning process.

Teachers in non-native English-speaking countries have to face many challenges in teaching. One of the things that becomes a challenge in studying English is the need for more vocabulary mastery. Language learners rely heavily on their vocabulary knowledge to master English as it is a prerequisite for learning the four language skills: reading, writing, listening, and speaking (Loi et al. 2020). In addition, Vocabulary is also one of the components that will significantly affect learners in language acquisition (Mangindaan, Et. al., 2020). Teachers must consider and fulfill the use of supportive media in teaching language because it can help them deliver material and affect the process of student language acquisition (Fatimah, et.al.,2019). One way to use supportive media is to rely on and develop existing technology into new learning media that help the teacher in the classroom.

Nowadays, technology plays an integral role in people's lives. Technology can help students and teachers carry out the learning process online or independently (Su and Zou 2022). Several technologies and applications have been developed to make it possible for educational purposes, such as Facebook, Wikis, Blogs, Learning Management Massaging, such as Google Classroom and Schoology, Blackboard, iTunes, or Moodle (Loi et al. 2020). The development of more advanced technology continues to lead to the creation of various innovations that aim to facilitate human life in multiple fields of life. One of the results of the development of technology today is the existence of Augmented Reality (AR) technology.

Augmented reality technology has positively influenced various fields, such as industry, entertainment, medicine, tourism, etc. However, experts state that augmented reality technology will continue to develop, which is still in its early stages. In the future, AR will become better, cheaper, and more accessible (Qiao et al. 2019). The development of augmented Reality, which has touched almost all

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aspects of human life, has also impacted the educational sector and is currently a trend many researchers are developing.

Moreover, the use of AR technology in education is supported by significant benefits at various levels of education (Garzón and Acevedo, 2019), as well as in language classes, one of which is English class. Many teachers utilize Augmented Reality-based media to teach English in the classroom, especially vocabulary. Some studies have shown that vocabulary learning using Augmented Reality can provide effective results for kindergarten students in Hong Kong (Lee et al. 2019) and Macau (Chen and Chan 2019) as well as in Indonesia, where the use of Augmented Reality for language teaching has been studied at the elementary school level (Shaumiwaty et al. 2022), vocational school (Maulidya, 2023), and higher education (Wahyuni et al. 2020).

This study is grounded in the theory of Multimedia Learning (Mayer, 2012), which suggests that learners understand and retain information more effectively when it is presented through both visual and verbal forms. In addition, the concept of Technology-Enhanced Language Learning (TELL) supports the integration of digital tools, such as AR, to improve language acquisition. These theoretical perspectives provide a foundation for understanding how AR can enhance vocabulary learning through interactive and multimodal experiences. The use of technology in education is very important, especially the use of audio-visual equipment, recording media, and computers. It emphasizes using hardware, innovative media, and industrial machinery methods for educational purposes. The software aspect of educational technology is also highlighted as helpful in promoting learning and motivation (Joshi, 2023).

There have been many studies conducted to see how the development of instructional media integrated with Augmented reality can increase students' proficiency in the field of vocabulary and how augmented reality has multimedia capabilities because of its features that allow interaction with its users and attract attention due to the visualization of the information produced (Fatimah et al. 2019). Despite the potential benefits of AR in language learning, its implementation in pesantren remains limited. Institutional restrictions on technology use, lack of access to digital devices, and limited exposure to interactive learning tools create significant barriers.

This indicates a gap between technological innovation and its practical application in traditional Islamic educational settings. While previous studies have examined the effectiveness of AR in various educational contexts, there is still limited research focusing on its application in pesantren environments, particularly in relation to English vocabulary learning. Therefore, this study aims to address this gap by exploring both the benefits and challenges of AR implementation in a pesantren setting.

In Indonesia, *Pesantren* is is one of the educational institutions that teaches and uses English. Teachers may need help teaching English in *Pesantren,* where the students focus more on learning Islamic teachings than general knowledge. They are unmotivated to learn English because it is not their native language and provides only limited purposes. Therefore, teachers' ability to utilize various teaching strategies is very important. Another aspect that causes students to have low motivation to study English is that most teachers still use an old method and-centered approach to teaching English in their classes (Umar, 2022).

Due to traditional teaching methods, it is necessary to implement learning materials using new and more modern ways to current technological developments. One technology that can be used is Augmented Reality, where material delivered initially using traditional methods can be poured into Augmented Reality. Most previous studies only discuss the use and design of augmented reality-based learning media for public schools, and limited literature has discussed using Augmented reality to teach vocabulary in *Pesantren.*

Depending on the particular situation, *Pesantren* has a different curriculum. Certain schools' curriculum and learning systems highly value teaching morality, self-reliance, and reading classical books (Anwar and Maman, 2023). To prepare students for life after school, some institutions concentrate on digitizing the educational process and using technology for administrative and instructional purposes (Shidiq and Mubin, 2022). These schools often use online learning tools, including Zoom, YouTube, Google Classroom, and Google Meetings.

The Salafi worldview, which emphasizes religious behaviour based on the Qur'an, the Sunnah of the Prophet, and the customs of previous righteous generations, is also practised in some *Pesantren* (Shidiq and Mubin 2022). Based on these problems, this study aims to find out how boarding school students experience using Augmented Reality (AR) technology in learning English vocabulary. Based on the background described, this study addresses the following research questions:

1. How does the use of Augmented Reality (AR) influence students' vocabulary learn in a pesantren context?
2. What are the benefits and challenges experienced by students when using AR in learning English vocabulary?

2. Method

This research uses qualitative methods with a case study research design. The participants were limited to female students due to the organizational structure of the pesantren, where learning activities and student groups are often separated by gender. This is acknowledged as a limitation, as the perspectives of male students were not included in this study. There are 6 female students from Islamic Boarding School students aged between 12-17 years old. They were

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interviewed regarding their experience in using Augmented Reality in learning English vocabulary.

The selection of respondents was carried out by random sampling with several criteria. First, the respondents were students of pesantren students, and second, they attended vocabulary lessons organized by the pesantren. The small number of participants (n = 6) is considered appropriate for this study, as it adopts a qualitative case study approach that focuses on in-depth exploration rather than generalization. This allows for a detailed understanding of students' experiences with AR in a specific educational context.

The researcher in this study used an interview guide and observation sheet to collect data. Observations were carried out to obtain data on how the student learning process at *Pesantren*, see the potential for using AR technology as a learning medium, and how the use of augmented reality in learning can affect the increase in enthusiasm, interest, and student achievement. Observations were conducted during several learning sessions to examine students' interactions with AR materials, their engagement levels, and classroom dynamics during the learning process. The pesantren setting is characterized by structured daily routines, strong emphasis on religious education, and restrictions on the use of digital devices such as smartphones. These conditions influence how technology, including AR, can be implemented in the learning process.

The interview used in this research is a semi-structured interview. Semi-structured interviews are a data collection method that combines structured and unstructured interviews. In semi-structured interviews, researchers use interview guidelines with pre-designed main questions but still give freedom to researchers to explore topics in more depth based on participant responses. The questions asked were about students' experiences in using Augmented Reality in learning Vocabulary. The interview lasted 15-30 minutes depending on the answers given by the students. Students who became respondents in there are 6 students. in this interview, the researcher first asked for their willingness to be interviewed for the research.

To analyze the data in this study, researchers used the thematic Analysis technique. Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) in qualitative data (Braun and Clarke 2006). According to Braun and Clarke in analyzing data, there are six steps taken:

1. Familiarization with the data: at this stage, the researcher reads the data re-reads the data to understand its content in depth, notes the initial ideas that arise.
2. Producing codes: at this stage, the data is divided into smaller units, and a code is assigned to each interesting or relevant segment of data.
3. Analysing codes into themes: The codes that have been generated are then grouped into potential themes.

4. Reviewing Themes: The themes that have been identified are evaluated to ensure they work well within the context of the overall data.
5. Defining and Naming Themes: Each theme was refined and clearly defined, and descriptive names were given to describe the core of each theme.
6. Compiling the Report: The researcher wrote a final report that explained the themes and how they related to the research questions.

To ensure the trustworthiness of the data, the researcher applied data triangulation by comparing findings from interviews and observations. In addition, the researcher carefully reviewed the data to ensure consistency and accuracy in the interpretation of the results. Data collection was conducted until data saturation was achieved, indicating that no new significant themes or information emerged from the participants' responses. Ethical considerations were applied in this study by obtaining permission from the school authorities and informed consent from participants.

Participants' identities were kept confidential, and the data were used solely for research purposes. The researcher acknowledges their role in the data collection and interpretation process and maintained reflexivity by minimizing personal bias and ensuring that the findings were grounded in the participants' actual responses.

3. Result

Research conducted on the implementation of Augmented Reality (AR) materials in a boarding school aimed at improving students' vocabulary, produced in-depth findings through thematic analysis. in this study, researchers used Flashcards with Augmented reality from Octagon Company as materials to introduce new vocabulary. Data collected through student interviews, and observations revealed several key themes. To provide a clearer overview of the participants involved in this study, the following table presents their demographic information.

Table 4.1. Participants' Demography

Participant	Age	Gender	Educational Level
Student 1	12	Female	Junior level
Student 2	13	Female	Junior level
Student 3	14	Female	Junior level
Student 4	15	Female	Junior level
Student 5	16	Female	Junior level
Student 6	17	Female	Junior level

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Table 4.2. the Findings of the Data

Phase 1: ***Familiarization with the data***	**Phase 2 dan 3:** ***Producing and analyzing the code***	**Phase 4:** ***Reviewing themes***	**Phase 5:** ***Naming themes***
• *"If I learn like this, I memorise the vocab faster because there are already animated pictures that move, and there is also a voice besides the vocab."* • *"so it's easy to remember the vocab, miss. Because there are already moving pictures, there is music and sound too, which makes it easier to remember.*	• Easy to memorize • Pronunciation is available • Easy to remember • It's had music	Improve students' ability to memorise and recall vocabulary	Retention
• *"It's fun to learn, there are cute pictures"* • *- ... not bored, because there are many cards, the animation is also good."* • *When you scan the picture, it's fun, especially when the animation comes out. So I'm excited to scan and learn more vocab."*	• Fun • Lots of images available • Not getting bored • Good animation • Moving animation • excited to scan and learn more vocab	many features that support student learning motivation	Motivation
• *"recommended to be applied here, but no mobile phones allowed here."*	• forbidden to bring handphone	Rules in Islamic Boarding School	Challenges

• *"This is good, but it's difficult if you want to implement it here because the rules are not allowed to bring mobile phones here."*	• Difficult to implement • Rules		

a. Improved Retention

The thematic analysis showed that students retained vocabulary better when using AR materials. the 3D visualizations and interactive features helped students form stronger associations with new words, which posits that combining visual and textual information enhances learning. It makes it easier for them to remember the vocabulary they see and is accompanied by interesting animations. in addition, the app is also equipped with pronunciation tools that can help students improve their skills. Vocabulary learning with AR in pesantren is an innovation that can improve students' information retention. As the learning experience becomes more interactive and engaging.

> P4: "If I learn to like this, I memorise the vocab faster because there are already animated pictures that move, and there is also a voice (pronunciation) besides the vocab." (Interviewed on 12 July 2024)
> P2: "I can quickly memorise because there are pictures and the sound is heard too. So you can also know how to pronounce it." (Interviewed on 12 July 2024)
> P5: "It's better than the book because there are animations, music, and the voice (pronunciation) is also taught." (Interviewed on 12 July 2024)
> P6: "Very helpful, because there is a picture directly shown so it is easy to know and easy to remember." (Interviewed on 12 July 2024)

The use of Augmented reality in learning vocabulary can improve students' ability, especially in memorising vocabulary. From the opinions given by P1 and P2, they stated that they are easier to memorise the vocabulary given because they can see the animation related to the vocabulary. Besides being easier to remember, they can also listen to the correct pronunciation of the vocabulary. This is also supported by P5 who stated that learning using augmented reality is more fun than learning using books as usual.

> P1: "It's very recommended. the problem is that English is difficult to pronounce, so this is great for learning because it includes pronunciation and pictures, so it's easy to remember." (interviewed on 12 July 2024)
> P3: "Because it is beneficial, the goal is to make it easier to remember vocabularies, and indeed the results are easier to remember than usual, Miss" (interviewed on 12 July 2024)

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After feeling the positive impact of the use of Augmented reality on teaching English, especially vocabulary, students recommend using Augmented reality more widely for learning, especially language learning in *pesantren.* Augmented reality flashcards that are used not only display engaging visuals and facilitate memory but also have an impact on improving pronunciation skills, which are often a challenge for students in learning English.

To strengthen the study's results, the researcher conducted an assessment for the students. the assessment results strongly supported improving students' vocabulary retention through Augmented Reality. The average student score reached 81,93 indicating increased students' ability to remember and understand the vocabulary learned using Augmented Reality flashcards. This shows that this learning method is effective in helping students reconstruct new words in their long-term memory. Thus, using augmented reality in vocabulary learning contributes significantly to improving students' memory.

The use of Augmented Reality (AR) in English vocabulary learning has shown significant promise in improving students' retention rates. AR technology provides an interactive and immersive learning experience that traditional methods often lack. by incorporating 3D visuals, animations, and gamified elements, AR makes vocabulary learning more engaging and enjoyable. for instance, students can interact with virtual objects that represent words, enhancing their understanding and recall through sensory and contextual reinforcement. This interactive approach not only captures students' attention but also aids in deeper cognitive processing, making the learned material more memorable.

Augmented Reality (AR) is highly relevant during English language learning sessions, both as part of the curriculum and in supplementary educational activities. AR technology brings a new dimension to learning by creating interactive and immersive experiences that captivate students' interest. AR can transform traditional lessons into engaging visual and interactive experiences, making complex vocabulary and grammar concepts more accessible and easier to understand. in supplementary activities, AR can provide additional practice and reinforcement outside the classroom, offering students the opportunity to engage with the material in a more personalized and enjoyable way. This dual application of AR ensures that students remain engaged and motivated, ultimately enhancing their retention and mastery of the English language.

b. Increased Motivation

English is profound and transformative. AR technology revolutionizes traditional language learning by providing interactive and immersive experiences that captivate students' attention and enthusiasm. Unlike conventional methods, AR integrates engaging visual elements and real-time interactions, making learning English more dynamic and enjoyable. This immersive approach stimulates students' curiosity and actively involves them in learning, leading to increased

motivation and a more profound commitment to mastering the language. AR presents visually appealing and contextually relevant educational content, which fosters a more engaging learning environment, significantly boosting students' motivation and overall academic experience.

> P5: "Better than learning from books" (interviewed on 12 July 2024)
> P6: "More interesting, than just using writing" (interviewed on 12 July 2024)
> P1: "It's more fun to use this (Augmented Reality), because it's more exciting, if it's a book, it can get boring". (interviewed on 12 July 2024)
> P3: "It is more interesting because it is not only the text or writing that is learnt but also the images and sounds. in addition, it is easy to remember because there is a picture that also has an explanation, Miss." (interviewed on 12 July 2024)

Using augmented reality in learning is something new for students. This technology motivates them because they feel that learning with AR is better than learning with books (P5) and more interesting than just seeing or memorizing writing (P6). Apart from the fact that they have a new experience besides learning from books, they also feel interested and motivated because the AR Flashcards used in learning have diverse images and attract their attention. in addition, the experience of the opportunity to scan the available photos and bring up the animation makes them more interested and motivated to see more pictures and animations, which indirectly increases their motivation to learn vocabulary.

The observation results showed a significant increase in students' enthusiasm when learning using Augmented Reality (AR). Students seemed more active and engaged during the learning session compared to traditional teaching methods. they showed high interest in the vocabulary provided through AR. This increased enthusiasm can be seen in more cheerful facial expressions, enthusiasm in following instructions, and positive responses to learning activities. This increase can be seen in many students who voluntarily want to try the AR application and interact with its features, which shows greater interest and curiosity toward learning.

In addition, students' participation in class also increased significantly with the use of AR. Observations noted that students contributed more frequently to class discussions and participated in group tasks. AR makes learning more exciting and provides opportunities for students to learn interactively and collaboratively. When using AR to learn new vocabulary, students actively help each other understand and remember words and practice using the language in sentences. AR has successfully created a dynamic and participatory learning environment, which supports improved understanding and retention of learning materials.

Initially, students exhibited high engagement and excitement when introduced to AR-based learning activities. This initial enthusiasm was evident through their active participation and eagerness to interact with the AR

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applications, which provided a significant departure from traditional teaching methods. the interactive and visually stimulating nature of AR was instrumental in capturing and maintaining students' attention, leading to a more dynamic learning environment.

Further data analysis indicated that AR significantly contributed to increased intrinsic motivation among students. the immersive experiences created by AR allowed students to engage with educational content hands-on, which was previously unattainable through conventional methods. This engagement was reflected in students' positive feedback and their preferred AR-enhanced lessons over traditional ones.

Additionally, AR fostered a sense of curiosity and exploration in students. the ability to interact with and manipulate digital objects in a real-world context encouraged students to ask questions and seek out further information. Observations noted increased spontaneous discussions and collaborative efforts among students, driven by their interest in the AR content. This shift towards a more inquiry-based learning approach highlights how AR can transform students' attitudes toward learning, making it a more engaging and intellectually stimulating process.

The research also identified a positive correlation between the use of AR and students' perceived relevance of the learning material. by connecting abstract concepts to interactive visualizations, AR helped students see the practical applications of their studies, thereby enhancing their perceived value of the lessons. for instance, students found it easier to relate historical events or scientific phenomena to their real-world implications through AR simulations, which further motivated them to engage with the subject matter.

c. Implementation Challenges on Augmented Reality in Pesantren

Islamic boarding schools have rules that are quite different from most schools in general. one of the most prominent is the prohibition of bringing or using electronic items such as mobile phones and laptops. This is a challenge that must be faced in the use of Augmented reality in *pesantren.*

> P3:" I want to use it here too, but I can't bring my mobile phone." (interviewed on 12 July 2024)
> P2: "This is good, but it's difficult if you want to implement it here because the rules are not allowed to bring mobile phones here." (interviewed on 12 July 2024)
> P4: "recommended to be applied here, but no mobile phones allowed here" (interviewed on 12 July 2024)

The students hope to be able to implement augmented reality for vocabulary learning in *pesantren*, however, the regulation that prohibits students from bringing mobile phones is one of the obstacles in implementing AR in

pesantren. While P5 stated that she did not recommend the use of AR in *pesantren.* this is because of the regulations of the *pesantren* that will make it difficult to apply. But according to her, if there is a possible solution for the implementation of AR in *pesantren,* then it is something good.

> P5: "Not recommended, because here you can't bring a mobile phone, so it can't be used." (Interviewed on 12 July 2024)
> P5: "Hmmm, if it turns out that it can be used (AR), It's Recommended." (Interviewed on 12 July 2024)

Pesantren faces several challenges in integrating AR technology into their educational systems. one of the most significant obstacles is the limited technological infrastructure, as many *pesantren* lack the advanced devices and stable internet connectivity required for AR applications. Additionally, there is often a prohibition against students bringing gadgets such as smartphones into the *pesantren*, which further complicates the use of AR technology. This restriction stems from a desire to maintain focus on religious and educational activities, but it also limits the availability of personal devices necessary for accessing AR content.

Furthermore, the existing curriculum may not be designed to accommodate AR, necessitating substantial adjustments and coordination between educators and administrators. Teacher training is another critical issue, as instructors must be adequately prepared to use and integrate AR tools effectively into their teaching practices.

There is a need for technology and internet availability in pesantren to support a more effective and interactive language learning process. Technology, such as computers, tablets, smartphones, and fast and stable internet access, enables various digital learning tools, including innovative language learning applications and platforms. From the observation, the use of technology in pesantren has yet to be maximized, especially in vocabulary learning. Technology such as projectors, computers, and audio are still limited to delivering teaching materials, listening, or watching videos.

With access to technology and the internet, students can access broader learning resources, interact with the subject matter interactively, and communicate with native language speakers through online platforms. in addition, teachers can also utilize technology to develop teaching methods that are more varied and adaptive to students' needs. With the support of adequate technology and internet infrastructure, pesantren may find it easier to maximize the potential of modern learning, which may hinder the development of student's language competence. therefore, investment in technology and the internet is essential and urgent to improve the quality of education in pesantren. However, not all students experienced the use of AR equally positively. Some participants reported initial

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difficulties in using the technology due to limited familiarity with digital tools and restricted access to devices in the pesantren environment.

4. Discussions

This section discusses the findings of the study by organizing them into four key aspects: (1) summary of the main findings, (2) theoretical implications, (3) practical implications, and (4) limitations and future research directions. The findings of this study indicate that the use of Augmented Reality (AR) in vocabulary learning provides significant benefits, particularly in improving students' vocabulary retention and learning motivation. However, its implementation is constrained by institutional regulations, limited access to technology, and the unique characteristics of the pesantren environment.

Students' Retention in Vocabulary Learning

Through interactive visual encounters, augmented reality (AR) showed significant potential in improving students' retention. AR applications provide students with a dynamic and captivating learning environment by including interactive and immersive aspects (Gargrish et al. 2021). By bringing material to life, enhancing motivation, and facilitating individualized learning, interactive graphics in augmented reality (AR) improve student retention through immersive and interesting learning experiences. With the help of these apps, students may interact with 3D models, see difficult ideas in real-time, and interact with the content from a variety of perspectives, which improves comprehension and recall of the subject matter (Rakshit et al. 2023).

From a theoretical perspective, these findings support Multimedia Learning Theory (Mayer, 2009), which emphasizes that combining visual and verbal elements enhances learning effectiveness. The use of AR flashcards allows students to engage with vocabulary through multiple sensory channels, which contributes to better retention. In addition, the findings align with Technology-Enhanced Language Learning (TELL), highlighting the role of digital tools in facilitating language acquisition.

Immersive experience refers to a state in which a person feels fully engaged and immersed in an environment or activity, such that they lose awareness of the outside world and become intensely focused on the experience. in education and technology, immersive experiences are often achieved through technologies that create highly realistic and interactive simulations or environments. Immersive experiences involve stimulating multiple senses, such as sight, hearing, and sometimes touch, to create a sense of presence within the digital environment. for example, in augmented reality (AR), students can see 3D objects and listen to sounds related to the learning material, which makes the learning experience more immersive.

Immersive experiences allow users to interact with elements in the environment they are exposed to. these interactions may include manipulation of digital objects, exploration of virtual features, or participation in activities that require an active response from the user. This interactivity makes users feel more involved and contribute to the experience. Virtual reality (VR) and augmented reality (AR) are often used to create immersive experiences. VR creates a virtual environment where users can interact with the digital world. At the same time, AR adds digital elements to the real world, creating an additional layer of information that can be accessed through smartphones or AR glasses.

Immersive experiences often lead to a sense of 'presence,' which is the feeling of being inside the simulated environment. This can increase student engagement and motivation in a learning context by making the subject matter more interesting and relevant. Research shows that immersive experiences can improve understanding and retention of information more effectively than traditional learning methods. Immersive experiences affect physical and sensory aspects and can influence users' emotional and cognitive responses. for example, in a learning simulation, students may experience higher feelings of engagement and motivation and more easily remember the information they have learned because the experience feels more real and meaningful.

Students who are actively engaged and enjoy the learning process tend to remember information better and longer. According to this study, students who utilized augmented reality (AR) felt more enthused and driven to acquire language, which eventually increased retention. Additionally, AR offers a deeper and more significant context for vocabulary development. Through simulations and scenarios presented by augmented reality technology, students can observe how words are utilized in authentic contexts. This helps students understand and retain words in appropriate conditions.

Through simulations and scenarios presented by Augmented Reality (AR) technology, students can observe how words are utilized in authentic contexts, significantly enhancing their understanding and application of language. AR allows learners to interact with immersive, 3D environments where vocabulary is not just presented as abstract concepts but is contextualized within realistic situations. This approach helps students grasp the practical use of words in various scenarios, making their learning experience more relevant and impactful.

AR simulations provide a dynamic platform for contextual learning, which improves vocabulary retention by allowing students to engage with language in meaningful contexts (Akçayır and Akçayır, 2017). AR can create realistic, interactive experiences that support deeper cognitive processing of language, leading to better comprehension and usage. these insights underscore the value of AR in bridging the gap between theoretical knowledge and practical application, thereby enhancing students' overall language proficiency and engagement.

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AR allows students to see things and ideas in an interactive three-dimensional form. for example, students can learn vocabulary about jobs, they can see AR animations that visualise them doing activities that match their jobs. Visualisations like this help students understand and remember the material because they can see abstract concepts become more real, in addition to combining various forms of media such as text, images, audio, and video, which help enrich the learning experience and improve information retention.

AR involves multiple senses in the learning process, such as visual, auditory and kinesthetic. This multisensory experience helps to enhance learning and improve information retention. AR's ability to engage these senses simultaneously allows for a richer and more dynamic learning environment. AR enhances visual learning by overlaying digital information onto the physical world, making abstract concepts more tangible and understandable (Chang and Hwang 2018). Additionally, auditory elements in AR applications can provide real-time feedback and pronunciation guides, which are crucial for language learning (Ibáñez and Delgado-Kloos 2018).

Kinesthetic learning is supported through interactive features that require physical movement, such as manipulating 3D objects or performing tasks that reinforce learning through action (Di Serio, Ibáñez, and Kloos 2013). Experts agree that this multisensory approach not only aids in better retention of information but also increases student engagement and motivation. the integration of visual, auditory, and kinesthetic elements in AR creates a holistic learning experience that addresses diverse learning styles and needs, making it a powerful tool in modern education.

Besides supporting learning by utilising the collaboration of multisensory experience, augmented reality learning media can also support students to conduct self-evaluation. Augmented Reality (AR) allows students to self-evaluate the material provided, fostering a more autonomous and reflective learning process. Through interactive AR applications, students can receive immediate feedback on their performance, helping them identify areas of strength and weakness. AR's real-time feedback mechanisms enable learners to monitor their progress and adjust their learning strategies accordingly (Cheng and Tsai 2013). This self-evaluation capability is particularly valuable in language learning, where students can practice vocabulary and grammar in a simulated environment and instantly see the results of their efforts.

AR applications often include quizzes, interactive exercises, and performance tracking, which encourage students to take ownership of their learning. by engaging in self-evaluation, students can develop critical thinking and self-regulation skills, leading to more effective and personalized learning outcomes. the ability of AR to support self-assessment not only enhances the learning experience but also aligns with modern educational approaches that emphasize student-centred learning and continuous improvement. However, while AR demonstrates clear benefits, its effectiveness depends on the availability of resources and institutional support. Without proper infrastructure and policy

adjustments, the use of AR may remain limited and cannot be implemented sustainably.

Another factor that can improve student retention is fun repetition. Fun repetition improves student retention by making it an interesting and non-boring learning experience. one of the main ways to reduce boredom is by utilizing methods that make learning fun. by integrating elements of games, challenges, and exciting interactions, students remain engaged and motivated, positively impacting their interest and engagement. Research shows that positive learning experiences can strengthen students' understanding and memory, reducing the boredom that often inhibits learning.

Active student engagement is a crucial factor influencing retention through enjoyable repetition. Methods such as educational games and AR applications allow students to interact directly with the subject matter so that they not only passively receive information but also actively process and apply it. This active engagement strengthens recall as students are more cognitively engaged with the material learned (Clark and Mayer, 2012). In addition, the repetition of material in relevant and exciting contexts, such as real-life scenarios, makes it easier for students to remember information by associating it with familiar and enjoyable contexts.

Students Motivation in Vocabulary Learning with Augmented Reality

An alternative definition of motivation is internal circumstances that stimulate, guide, and carry out behaviour toward a particular goal (Andreu 2023). In the context of education, motivation is described as a condition in which students need to meditate and experience disruption; it manifests itself again and persists in their attention during any given lesson. To produce the skills and abilities required to accomplish objectives requires that students pay closer attention to every subject throughout the entire teaching-learning process. Additionally, for the involvement of one side without the other to be fruitless, this state needs to be present in both teachers and students (Valencia, et.al, 2023).

AR technology appears to have a positive impact on student motivation. This level of satisfaction can be attributed to several factors. the factors of entertainment, gamification, and fun, can all be considered as key factors of the positive attitude that the participants had towards AR. Students feel motivated when learning using AR because they get 'something new' that is different from what they got or learned before. the AR display with funny and interesting animations, makes students not bored in learning.

a. Entertainment Factor

The entertainment produced by AR technology can increase students' interest and engagement in learning (Akçayır and Akçayır 2017). the use of interesting and interactive animations makes the learning process more enjoyable

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for students. for example, when learning vocabulary in a foreign language, students can see and interact with 3D objects depicting the words, which is visually and sensorially more engaging than conventional learning methods.

The entertainment produced by Augmented Reality (AR) technology can significantly increase students' interest and engagement in learning. AR integrates fun and interactive elements into educational content, transforming traditional lessons into captivating experiences. for instance, students learning vocabulary can interact with 3D models, play educational games, and receive immediate feedback, making the learning process enjoyable and immersive. AR's ability to combine educational material with entertaining features leads to higher levels of student motivation and participation (Akçayır and Akçayır 2017).

Augmented reality (AR) flashcards represent a significant advancement in educational technology, particularly in language learning. one of the most notable impacts of AR flashcards is their ability to incorporate entertainment into the learning process, which plays a crucial role in increasing students' motivation to learn English. by transforming traditional flashcards into interactive, visually stimulating experiences, AR provides a more engaging and enjoyable way for students to acquire new vocabulary and language skills. This fusion of learning with entertainment, or "edutainment," captures students' interest and makes the learning process less monotonous (Chen and Chan 2019).

The entertainment value of AR flashcards is primarily derived from their interactive features. Unlike conventional flashcards, AR flashcards can present dynamic 3D models, animations, and sound effects, making learning more immersive. For instance, when a student points their device at an AR flashcard featuring a new vocabulary word, it might display an animated scene or object visually representing the word. This engaging visual representation helps students better understand and remember the word's meaning, making the learning experience more memorable and enjoyable.

Furthermore, AR flashcards often incorporate gamified elements that enhance their entertainment value. these can include interactive quizzes, puzzles, or challenges related to the vocabulary being studied. by integrating these game-like features, AR flashcards create a playful learning environment where students are motivated to complete tasks and achieve higher scores. This element of friendly competition and achievement increases student engagement and fosters a sense of accomplishment and progress in their language learning journey.

The entertainment aspect of AR flashcards also helps reduce the cognitive load associated with language learning. Traditional language learning methods can sometimes be overwhelming or tedious, leading to disengagement. AR flashcards, however, break down complex language concepts into visually engaging and interactive components, making them more accessible for students to digest. This reduction in cognitive load allows students to focus more on learning and less on overcoming the inherent difficulties of language acquisition.

The novelty and excitement of AR can sustain students' attention and interest over longer periods by enhancing situational interest, improving learning achievement, and increasing engagement in various educational settings, leading to better retention and understanding of the material (Setyaningsih et al. 2024). The immersive nature of AR creates a sense of presence and involvement that traditional teaching methods often lack. This heightened engagement is crucial for deep learning, as it encourages students to explore and interact with the content more thoroughly. by making learning more enjoyable and interactive, AR not only enhances student engagement but also promotes a more positive attitude towards education, ultimately contributing to improved academic outcomes.

b. Gamification Factor

Gamification factor also plays an important role in increasing student motivation, particularly in the context of Augmented Reality (AR) in education. by incorporating game-like elements such as points, badges, leaderboards, and challenges into learning activities, AR makes the educational experience more engaging and competitive (Febriansah,et.al., 2021). Gamification leverages students' natural tendencies for competition and achievement, which can drive them to invest more time and effort in their studies. the implementation of gamification in educational settings has been shown to enhance students' motivation and participation (Xiaoshang et al. 2024). This is especially true when students can track their progress and compare it with their peers, adding a layer of social interaction and competition that further stimulates their desire to learn.

A dynamic and captivating learning environment is created by the gamification elements of augmented reality, which include point systems, interactive challenges, and rewards that can keep students engaged. these gamified elements appeal to students' natural desires for competition and achievement, making learning more enjoyable. Furthermore, AR's interactive nature allows for personalized learning experiences where students can learn at their own pace and in their style. This personalization not only boosts engagement but also helps cater to diverse learning preferences and needs, making the educational experience more inclusive and effective.

Experts agree that the interactive and immersive nature of AR, combined with gamification, creates a powerful tool for education. Gamified learning environments increase students' intrinsic motivation by making the learning process more enjoyable and fulfilling (Jaramillo-Mediavilla et al. 2024). In language learning, gamification can be particularly effective, as it allows students to practice vocabulary and grammar in a fun and engaging way, reducing the monotony often associated with rote memorization. the immediate feedback provided by AR games helps students understand their mistakes and learn from them in real time, which enhances their learning outcomes and retention rates.

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Moreover, gamification through AR can cater to different learning styles and preferences, making it a versatile tool for educators. Students who might struggle with traditional teaching methods often find gamified AR activities more accessible and motivating. by providing a variety of challenges and rewards, AR can keep students of all levels engaged and motivated to learn (Anderson et al. 2010). This approach not only improves academic performance but also fosters a positive attitude towards learning, encouraging students to become lifelong learners. the combination of AR and gamification thus holds great potential to transform educational practices and significantly boost student motivation and achievement.

AR allows students to see the immediate results of their efforts, such as earning points or reaching certain levels in a learning application. these achievements provide positive feedback that increases the sense of accomplishment and encouragement to continue learning. increased sense of achievement refers to the feeling of accomplishment or success that students feel when they reach a goal or successfully complete a specific task. in an educational context, this means students feel proud and satisfied after reaching a milestone or completing a learning activity, which can strengthen their motivation to continue learning and try harder. AR allows students to see the immediate results of their efforts, such as earning points or reaching certain levels in a learning application.

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Positive feedback often accompanies an increased sense of achievement, which confirms that students' efforts are paying off. for example, when students complete a quiz well or successfully reach a certain level in a gamification-based learning application, they receive an award or recognition. This positive feedback provides an emotional boost that strengthens students' confidence and motivation to keep learning.

When students feel a sense of achievement, they feel more confident in their ability to overcome challenges and achieve learning goals. increased confidence helps students feel more competent, increasing their motivation to keep trying and learning. A positive sense of achievement makes students feel that their efforts are worthwhile and effective, which motivates them to stay committed to their learning (Hardianti, 2024).

A sense of achievement can strengthen intrinsic motivation, which is the drive to do an activity because you enjoy the process and feel satisfied with the achievement itself. Students who experience success are more likely to feel excited and confident with the learning process, not just the result. High intrinsic motivation encourages students to continue engaging in learning activities because they find personal value and satisfaction in the experience.

Students' achievement is closely related to goal setting, where students set small and medium-sized goals that can be achieved within a specific timeframe. When students accomplish these goals, they feel a sense of accomplishment, which provides the impetus to continue setting and achieving higher goals. This process

creates a positive cycle where consistent achievement encourages students to continue to strive and improve their achievements

3. Implementation Challenges

a. Pesantren *Rules on Electronic Devices*

It is crucial to understand the technology used when implementing Augmented Reality-based instructional activities as it directly impacts the probability and intensity of discomfort. in this case, electronic devices such as tablets, laptops, or smartphones are required. According to some previous studies on the use of augmented reality, smartphones were used as assistive technology in about half of the implementations of those studies (Koç, et.al, 2022). The main reason is that every student has one, which allows them to create customised activities without having to share them with other students.

One of the main challenges in implementing AR in *pesantren* is the limited technological infrastructure. Many *pesantren* do not yet have access to advanced technological devices and stable internet networks, which are prerequisites for running AR applications (Wu et al. 2013). In addition, there is a prohibition for students to bring smartphones to *pesantren*. these limitations make it difficult for *pesantren* to widely and effectively adopt AR in daily teaching and learning activities.

Pesantren's policy on bringing electronic devices or smartphones is usually implemented to keep students focused on studies and religious activities as well as to avoid distractions caused by the use of electronic devices. While this policy serves a good purpose, it also hinders the application of AR technologies that mostly require the use of smartphones or other mobile devices. This restriction adds another layer of complexity in the effort to integrate modern technology into the *pesantren* education system. Apart from the regulations on the use of smartphones in *pesantren,* according to researchers, other challenges must be anticipated by *pesantren* in the application of Augmented reality as one of the learning media.

b. Curriculum Integration

Integrating technology into the curriculum is essential for modernizing education and enhancing learning outcomes. When effectively incorporated, technology can transform traditional teaching methods by providing interactive and engaging learning experiences. Technology integration can significantly impact student learning, with its effects being more pronounced when aligned with pedagogical strategies and learning goals. by leveraging digital tools and resources, educators can create dynamic lesson plans catering to diverse learning styles and needs, increasing student engagement and motivation (Malik, 2023).

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Technology integration also enhances collaboration and communication among students. Digital tools such as collaborative platforms (e.g., Google Workspace and Microsoft Teams) allow students to collaborate on projects, share resources, and provide real-time peer feedback. Technology can facilitate collaborative learning environments where students engage in higher-order thinking and problem-solving tasks. the platform not only supports group work but also prepares students for the collaborative nature of the modern workforce (Anuyahong and Pucharoen 2023).

In addition to improving student engagement and collaboration, technology integration helps educators access a wealth of resources and data for learning planning and assessment. Tools such as data analytics and learning management systems (LMS) provide teachers with insights into student performance, enabling more informed instructional decisions. Technology-based data collection and analysis can lead to more effective teaching strategies and better educational outcomes. Educators can use these tools to track progress, identify trends, and adjust their teaching methods to meet student needs better.

The implementation of AR in *pesantren* also requires careful curriculum adjustments and readiness. the readiness of the school curriculum to implement Augmented Reality (AR) is crucial to ensure this technology can be used effectively in the learning process. one of the first steps that needs to be taken is the customisation of the curriculum to integrate AR technology into various subjects. the curriculum should be designed in such a way that it not only covers relevant subject matter but also provides space for the use of interactive technologies such as AR.

The curriculum in *pesantren* may not have been designed to accommodate the use of technology such as AR, thus requiring a comprehensive revision. these adjustments include integrating AR materials into the existing syllabus as well as determining how to evaluate them by technology-based learning methods. Curriculum adapted to AR technology can increase student engagement and facilitate deeper learning. therefore, it is crucial to align the curriculum with the needs and potential offered by AR (Takrouri, et.al, 2022).

This curriculum adjustment does not only require material changes but also takes time and coordination between various stakeholders. *Pesantren* managers, teachers, and education policymakers must work together to design an effective curriculum. This process includes training teachers to master AR technology and new teaching methods, as well as providing adequate resources. Without a proper curriculum and supportive facilities, the use of AR can become undirected and not provide maximum benefits for students. A well-designed curriculum ensures that AR technology is used effectively to achieve specific learning objectives. It also prevents wastage of resources and ensures that students have a meaningful learning experience.

To integrate AR effectively, the curriculum must be customised to include the use of this technology in various subjects. Teachers need to liaise with curriculum developers and educational technologists to identify areas where AR can add significant value. for example, in science lessons, AR can be used to visualise complex concepts that are difficult to explain through text or static images. With the right curriculum adaptation, AR can be a powerful tool to enrich students' learning experiences and improve their understanding of the subject matter (Ibáñez and Delgado-Kloos 2018).

c. Teacher Readiness in Implementing AR

The effective integration of technology in education hinges significantly on teachers' readiness to implement and utilize these tools effectively. As educational technology becomes increasingly prevalent, educators must be well-prepared to leverage these innovations to enhance the learning experience. Teacher readiness encompasses familiarity with technological tools and the ability to integrate them into pedagogical practices meaningfully. Recent studies highlight that with adequate preparation, the potential benefits of technology in education may be fully realized, which underscores the importance of investing in teacher readiness for technology-enhanced learning environments.

Teachers have an important role in utilising technology and ensuring its effectiveness in learning. the presence of teachers can enhance the impact of augmented reality technology on student learning outcomes (Shams 2019). The teachers should have an important role in exploring useful technology-based teaching practices to develop more creative teaching methods. A deep understanding of the use of technology and its focus in education is needed, as many teachers face practical challenges in the application of technology and need appropriate training and development to support their desire to use technology effectively.

One key aspect of teacher readiness is professional development. ongoing training is essential for teachers to stay updated on technological advancements and instructional strategies. Effective professional development programs focus on practical application and allow teachers to practice using technology in classroom settings. Such programs help educators build the necessary skills to integrate technology into their teaching practices, thus improving their confidence and competence in using these tools effectively. This preparedness enables teachers to design and deliver lessons that utilize technology to enhance student engagement and learning outcomes.

The teachers' training should cover the technical aspects of AR devices, such as operating the application and the required hardware, and pedagogical strategies for integrating AR into the learning process. Teachers must understand how AR can enrich subject matter and increase student engagement. An effective training programme should also include hands-on practical sessions where

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teachers can test and experiment with AR technology in their teaching context (Bower et al. 2014).

Another critical component of teacher readiness is access to resources and support. Teachers need adequate resources, such as hardware, software, and technical support, to effectively implement technology in their classrooms. teachers who have access to well-maintained technological resources and technical support are more likely to use technology effectively in their teaching. the availability of these resources ensures that teachers can address technical issues promptly and focus on delivering high-quality instruction.

Thus, providing teachers with the necessary tools and support is essential for successfully integrating technology into the curriculum. Schools or universities should provide the necessary resources, such as AR devices, access to educational apps, and adequate technology infrastructure. in addition, educational institutions should create an environment that supports innovation and experimentation, where teachers feel comfortable to try new approaches and share experiences with peers. This support should also include readily available technical assistance to handle problems that may arise during the use of AR in the classroom (Arief et al. 2023).

d. Distraction in the Implementation of Augmented Reality

The visually rich and engaging nature of Augmented Reality (AR) can inadvertently create a sensory overload for learners, especially when the content is visually dense. This excessive stimulation can divert students' attention away from the core educational material and towards the novelty of the technology itself. Research indicates that cognitive function can be compromised when students are bombarded with visual information, resulting in decreased learning effectiveness.

Furthermore, the captivating visuals in AR can distract students from the main learning objectives. A phenomenon known as peripheral attention may occur, where learners become engrossed in non-essential elements within the AR environment. for example, if an AR application contains elaborate animations or interactive features unrelated to the lesson, students may be tempted to explore these distractions rather than focusing on the crucial educational content.

The novelty and excitement surrounding augmented reality (AR) can sometimes overshadow the learning objectives. Students may become more fascinated by the technology, spending time understanding its mechanics or experimenting with its visual capabilities rather than focusing on the educational content. This distraction can hinder the retention of important knowledge and ultimately impact overall learning achievement.

Successful integration of AR into the classroom requires careful instructional planning to ensure that visual elements enhance rather than hinder learning. With careful consideration, AR can disrupt the established flow of traditional teaching methods, creating a disjointed learning experience where students need help connecting AR content to a broader educational framework. the

possibility of such disruption is particularly pronounced among younger students or those quickly enamoured by technology. these learners may have difficulty transitioning from engaging AR environments to more conventional learning activities, disrupting their learning progress (Papanastasiou et al. 2019).

Augmented Reality (AR) interactive features are designed to increase student engagement and ease understanding of abstract concepts. However, these features can also be a significant source of distraction, diverting students' attention from the actual learning objectives. Some of the mechanisms that cause this distraction include focussed attention on irrelevant interactive elements, over-exploration of AR features, and imbalance between interactivity and learning content.

Interactive features in AR, such as 3D animations, sound effects, and simulations, are often eye-catching. However, if these elements are not directly related to the learning objectives, they can distract students' focus from the core material. When students are more interested in how the animation works than in the information conveyed through the animation, they are less likely to absorb the learning content well (Dunleavy, et.al. 2009). When students are given the freedom to interact with various elements in AR, there is a risk that they will explore those features without focusing on the learning objectives. Students are often encouraged to experiment with the technical aspects of AR, which can distract them from the material to be learnt. This is primarily a problem when the features offer a more engaging experience than the subject matter itself.

In education, Augmented Reality (AR) promises a more engaging and interactive learning experience. However, if not designed carefully, this technology can distract students from the primary purpose of learning. Too often, we see AR that prioritises entertainment over education. Engaging interactive features, such as stunning animations and realistic simulations, can indeed attract students. However, the underlying learning content is not presented profoundly and meaningfully. in that case, students will only be trapped in temporary fun if they understand the concepts.

In this context, it is important to maintain a balance between interactive aspects and learning content. AR should be a tool to enrich students' understanding of the material, not just a tool to make learning more fun. the learning objectives will not be achieved if the interactive features obscure or replace the substantial content. Students may remember the interesting visual effects more than the core concepts that the teacher wants to teach.

Furthermore, the findings highlight the interaction between technology and the cultural context of pesantren. The restriction on smartphone uses and strong emphasis on traditional learning practices influence how AR can be integrated into the classroom. This indicates that technological innovation must be adapted to align with the values and regulations of Islamic educational institutions. Based on these findings, several practical recommendations can be proposed. For pesantren administrators, it is important to consider flexible policies that allow controlled use of educational technology.

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For teachers, integrating AR with context-based and culturally relevant materials can enhance its effectiveness. For policymakers, providing infrastructure support and teacher training programs is essential to ensure successful implementation. Additionally, technology developers should design AR applications that are adaptable to low-resource environments and align with cultural values.

5. Conclusion

This study explores students' experiences in using Augmented Reality (AR) materials in Islamic boarding schools to improve their language vocabulary. the results showed that students responded very positively to the use of AR technology. Students felt more interested and motivated to learn new vocabulary through AR materials compared to conventional methods. the interactive and visual learning experience presented by AR helps students more easily understand and remember new vocabulary, which in turn improves their language skills.

To get results from the students' experiences, the researcher used semi-structured interviews. in this interview, the respondents will answer several questions about their experiences while using augmented reality in learning vocabulary. the data obtained from the respondents will then be processed to obtain results. With the thematic analysis technique, the results of this study state that three main things arise in the implementation of Augmented reality in *pesantren* to learn vocabulary.

The result of this study found that there are three main themes of students' experience with augmented reality. First is retention, where according to students using augmented reality, they find it easier to remember or memorise the vocabulary given. Second, there is an increase in student motivation in learning due to the entertainment and gamification factors. Third is the challenges faced in the use of augmented reality in *pesantren* which include limited facilities, teacher readiness, and integration with the curriculum. This study contributes to the field of educational technology by providing insights into the use of AR in a religious educational context, particularly in pesantren. It highlights the potential of AR to enhance vocabulary learning while also revealing the contextual challenges that influence its implementation.

Despite its contributions, this study has several limitations. First, the study involved a small sample size (n = 6), which limits the generalizability of the findings. Second, the participants were limited to female students, which may introduce gender bias. Third, the study was conducted in a single pesantren, which may not represent other educational contexts. These limitations should be considered when interpreting the results. Future research is recommended to involve a larger number of participants, include both male and female students, and explore the implementation of AR in multiple pesantren settings. Additionally, longitudinal studies are needed to examine the long-term impact of AR on language learning outcomes.

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