

Revolutionizing Language Learning: Exploring the Efficacy of Augmented Reality Technology Through Assemblr Studio

Prasetyo Yuli Kurniawan^{1*}, Elsara Khairun Nisa¹, Fitriana Kartika Sari¹, and Nur Ariesanto Ramdhan¹

¹Universitas Muhadi Setiabudi, Brebes, Indonesia

Abstract. The use of AR in education has garnered attention as an innovative method to enhance engagement and effectiveness of learning. This study focuses on integrating Augmented Reality (AR) into language learning to understand how it can improve student motivation, communication skills, and writing proficiency. The research aims to explore and analyze the impact of implementing AR technology using Assemblr Studio in language learning contexts. The research methodology employs a mixed methods approach, with data collected through surveys, language proficiency tests, interviews, and participatory observations. The study involves students at Muhadi Setiabudi University learning with AR-based educational media tailored for language learning. Results show that implementing Augmented Reality (AR) using Assemblr Studio produces innovative learning media, particularly in writing and speaking skills. Three-dimensional (3D) media using AR is found effective in learning, with students responding positively to its use. Furthermore, AR technology can enhance the quality of language learning by providing engaging, interactive, and personalized learning experiences, fostering better understanding and authentic language use in real-world contexts. Keywords: *Augmented Reality*, Language Learning, Speaking Skills, Writing Skills

1 Introduction

1.1 Background of research

The transformation of education through information technology has brought about profound changes in the way we learn and teach. The introduction of online learning (e-learning) has changed the traditional paradigm, allowing students to access learning materials from anywhere through virtual classrooms and electronic learning platforms [1]. Digital learning resources, such as e-books and interactive learning applications, increase the appeal of learning in innovative and engaging ways [2]. Automatic evaluation and instant feedback through technology help measure student understanding more efficiently. Lecturer training is also enhanced through online resources, while technology supports inclusive education and

* Corresponding author: prasetyo_yk@umus.ac.id

expands access to education globally. Educational analytics and big data help personalize curriculum and learning strategies [3]. Privacy protection and data security are key concerns, and the development of technological infrastructure is key to ensuring equality of access. With this transformation, education becomes more adaptive, efficient, and relevant in facing the dynamics of the digital era.

The use of Augmented Reality (AR) in a learning context has extraordinary relevance. AR presents a new paradigm by bringing together the physical and digital worlds, allowing students to experience more immersive and interactive learning. In an educational context, AR facilitates the visualization of abstract concepts, allowing students to see them in real life [4]. Additionally, this technology provides opportunities for interactive simulation, allowing students to conduct experiments and simulations without actual physical risk. Location-based learning with AR enables the exploration of historical sites or geographic locations directly from within the classroom. Apart from providing practical skills training, AR also encourages collaborative learning and personalized learning [5]. Through AR, learning not only becomes more motivational and fun but also more inclusive with increased educational accessibility. Better assessment and immediate feedback are also advantages of this technology. Overall, integrating AR in education stimulates creativity, increases student participation, and creates a learning experience that is more relevant to today's demands [6].

The importance of language learning in the digital era cannot be underestimated, considering the fundamental role of language in accommodating the challenges and opportunities that arise in this era. First, the global access provided by technology strengthens the need for language competence [7]. With global connectivity becoming easier, the ability to communicate through language is key to overcoming cultural barriers and building cross-border collaboration.

Second, in a digital context, language mastery supports digital literacy. The ability to read, write, and communicate effectively in a language not only allows one to understand digital information but also contributes to building meaningful digital content. Language literacy in digital contexts opens the door to the development of multimedia skills, online content writing, and active participation in various digital platforms [8].

Furthermore, language is key to understanding and optimizing technology. As technology develops, new terms and concepts continue to emerge. Language skills enable individuals to understand documentation, instructions, and discussions related to technology, facilitating more effective use of technology. In addition, in the digital era filled with information, the ability to assess and filter information becomes important. Critical reading and text analysis skills, including knowledge of specialized terminology in the field of technology, help individuals to navigate large and often complex flows of information.

Finally, the importance of language learning in the digital era lies in its ability to build interpersonal communication skills [9]. Although technology provides a platform for digital communication, effective speaking and writing skills remain the foundation for interacting with others, both in professional and social contexts. Thus, language learning in the digital era not only provides access to global culture and collaboration opportunities, but also opens the door to better use of technology, understanding digital information, and developing communication and literacy skills that are relevant to the demands of today's digital world.

The relevance of Augmented Reality (AR) in language learning makes a major contribution to a more engaging and effective learning experience [10]. First of all, AR allows teaching words and phrases more visually and contextually. By integrating virtual elements into a physical environment, students can see and interact with objects and situations that create a context for the use of words in more real language. Second, AR facilitates learning through real-life simulations. For example, students can participate in practical communication situations, such as ordering food at a restaurant or interacting in social roles, which enriches everyday communication skills in the target language. Furthermore, AR can

increase student engagement through interactive learning. Students can use AR devices to explore additional content such as video, audio, or images, deepening their understanding of cultural and linguistic contexts [11].

The use of AR also supports contextual learning [12]. Students can see translations, definitions, or additional information when viewing certain words or phrases through AR devices. This helps them understand words in a broader and more relevant context. Additionally, AR stimulates creativity in language learning. Students can create their own AR content, such as storyboards, presentations, or AR-based art projects, which allows them to actively contribute to the learning process and improve their expression skills in the target language. The importance of AR in language learning is also reflected in its ability to provide immediate feedback. Students can listen to and record conversations, get immediate feedback via related AR devices, and improve their pronunciation or understanding quickly. By utilizing the advantages of AR in a language learning context, teachers can create learning experiences that are more fun, practical, and relevant, which ultimately improves students' language proficiency significantly.

Based on the phenomenon that has been described, the implementation of *Augmented Reality* (AR) technology using Assemblr Studio in language learning is very important. This is because AR provides a more interesting and interactive learning experience, increasing student motivation to be actively involved in learning. Through Assemblr Studio, lecturers can create simulative AR content, creating contextual situations where students can practice using language in everyday life. The use of AR can also increase information retention by utilizing visualization and simulation. Students are more likely to remember and understand course material when they are visually engaged and interact directly with the content. In addition, AR enables a more individualized learning experience, according to each student's level of understanding, especially in language learning.

2 Method

This research methodology employs a mixed methods approach, integrating quantitative and qualitative analyses. For quantitative data collection, surveys and language proficiency tests serve as the primary tools. Surveys provide a general overview of students' experiences with AR-based learning media, while language proficiency tests yield statistically measurable academic progress data.

Qualitative data collection involves in-depth interviews with participants and participatory observations during the learning process. In-depth interviews allow researchers to gain profound insights into students' experiences and perceptions regarding the use of AR learning media in language education. Meanwhile, participatory observations offer opportunities for researchers to directly observe the interaction between students and AR learning media.

The research sample consists of students at Muhadi Setiabudi University engaged in learning using AR-based educational media, specifically designed to enhance language learning effectiveness. Utilizing a mixed methods approach enables researchers to obtain a holistic understanding of the impact of AR learning media on students' language proficiency.

Quantitative data analysis involves calculating survey and language proficiency test results and using statistical methods to identify significant trends and patterns. Qualitative data analysis entails transcription and coding of interviews and observations to identify main themes, patterns, and differences in students' experiences and perceptions. Integration of findings from both approaches is expected to provide a comprehensive understanding of the effectiveness of AR learning media in the context of language education within the university environment.

3 Result and discussion

The results of the research can provide several findings, namely the effectiveness of AR technology, student responses to using AR with Assemblr Studio (**Fig. 1.**), and the role of AR technology in improving the quality of language learning. The explanation of these findings can be explained as follows.

3.1 Effectiveness of AR technology implementation

3.1.1 Increasing student participation

The application of Augmented Reality (AR) technology in learning has had a positive impact on student participation, as seen in quantitative data from field observations. Before implementing AR, the average student participation in the experimental group was 60%, while the control group only reached 45%. However, after the implementation of AR, there was a significant increase in student participation rates in both groups.

In the experimental group, student participation increased markedly from 60% to 85%. This shows that the use of AR technology has succeeded in increasing student involvement in the learning process. Factors such as the interactivity and visual appeal provided by AR may have provided a positive boost to students' interest in actively engaging in learning.

On the other hand, although the control group also experienced an increase in participation after field observations, this increase was not as large as the experimental group. Student participation in the control group only increased to 50%, indicating that the use of AR technology had a more significant impact in increasing student engagement compared to conventional methods.

3.1.2 Increasing understanding of language learning

Student exam result data provides concrete evidence that the use of Augmented Reality (AR) technology has a positive impact on understanding the material, with significant improvements seen in the experimental group. Before implementing AR, the average language comprehension score starting from writing and reading skills in the experimental group was 70, and after implementing AR, there was a significant increase, namely to 87.5.

This significant increase in understanding of language learning can be interpreted as an indication that AR not only increases student participation but also effectively supports their understanding of language learning materials. The interactivity factor and visual experience provided by AR may have helped students understand the concepts being taught. Student learning using AR media with Assemblr Studio can be seen in the following picture.

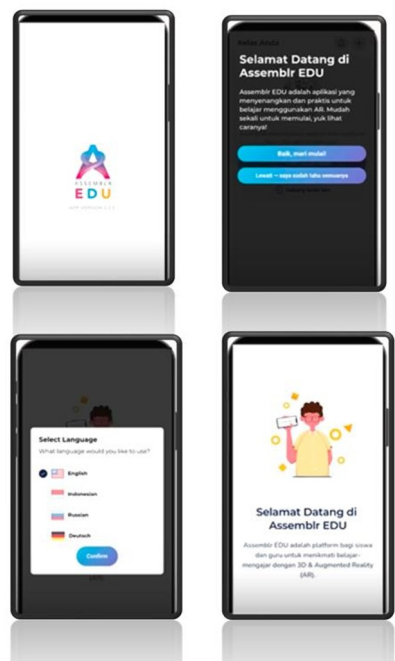


Fig. 1. AR Technology with assemblr study

3.2 Student response to using AR with Assemblr Studio

3.2.1 Student satisfaction level

The results section is written in chronological order as presented in the method section. The important thing in presenting results is that the author must not include references in this section. This section is the "findings" of the author himself.

The questionnaire given to students provided a positive picture regarding their satisfaction with using Assembly Studio, an Augmented Reality (AR) technology. Analysis of data from the questionnaire illustrates that there is a high level of satisfaction both in qualitative and quantitative terms.

From a qualitative perspective, student responses through qualitative data show that as many as 90% of students feel very satisfied with the learning experience using AR. This statement reflects student satisfaction with the use of Assembler Studio in improving the quality of their learning. These positive responses may reflect a more interesting, interactive, and memorable learning experience provided by AR technology.

From a quantitative perspective, quantitative data shows that 85% of students gave high marks for their level of satisfaction with AR technology. High scores from the majority of respondents confirm that Assemblr Studio is considered to provide significant added value in the context of student learning. A high level of satisfaction can reflect the effectiveness of AR technology in providing a satisfying learning experience.

3.2.2 Increased learning motivation

Apart from the high level of satisfaction, interviews with students also produced qualitative data showing a significant increase in their learning motivation after using Augmented Reality (AR) technology. As many as 80% of students stated that they felt increased motivation to learn languages after being involved in learning with AR. This statement reflects the positive impact of AR in stimulating students' interest and enthusiasm for language learning.

Furthermore, quantitative data confirmed these qualitative findings by showing that there was an increase of 25% in the level of student learning motivation in the experimental group. An increase of this magnitude reflects the positive and significant impact of using AR in increasing student motivation. Factors such as elements of interactivity, meaningfulness, and visual appeal provided by AR may have provided a strong incentive for students to be more enthusiastic and committed to the learning process.

3.3 The role of AR technology in improving the quality of learning

3.3.1 Understanding language concepts

In-depth interviews with lecturers and analysis of student assignments provide strong qualitative insights into the role of Augmented Reality (AR) technology in improving understanding of language concepts. Lecturers reported that the use of AR content significantly improved students' ability to explain language concepts. This data reflects the positive impact of AR as an effective learning aid in providing a deeper understanding of learning material.

Lecturers report that students are better able to explain language concepts using AR content, highlighting how the technology can help visualize and illustrate concepts that may be difficult to understand through conventional learning methods. Students' ability to explain language concepts better after using AR shows that this technology can act as a tool that supports a more effective concept understanding process.

Qualitative data generated from the analysis of student assignments also shows the positive impact of AR. As many as 75% of students were able to explain language concepts better after using AR. This high percentage reflects that AR can make a significant contribution to helping students understand and master learning material better than traditional learning methods.

3.3.2 Involvement in the learning process

Qualitative data from interviews with lecturers highlights increased student engagement as a positive impact of using Augmented Reality (AR) technology in the learning process. Before AR was implemented, only 40% of students were actively involved in class discussions. However, after implementing AR, lecturers noted a significant increase in student engagement levels, reaching over 70%.

This increase reflects that AR can create a more interesting learning environment and stimulate student participation. The interactivity factor and visual appeal provided by AR may have motivated students to participate more actively in class activities. It is likely that the element of novelty and uniqueness of AR technology also provides additional encouragement for students to engage more actively.

3.4 Discussion

Based on the research results that have been presented, the discussion will be explained more fully as follows.

3.4.1 Increasing student participation

This study is consistent with the findings of Diaz [13] which states that the use of AR in learning can increase student involvement through aspects of interactivity and visual appeal [13]. Through this aspect, students can increase motivation in learning languages by using AR as a learning medium.

3.4.2 Increasing understanding of language learning

Student exam results showed a significant increase in comprehension scores from 70 to 87.5 after implementing *Augmented Reality* (AR) technology. These findings provide a strong indication that AR is effective in supporting the understanding of language learning concepts [14]. This reference shows that the increase in understanding is not only statistical but also substantively related to the language concepts taught in the context of using AR in learning.

a. Student satisfaction level

Support from previous research, as highlighted by Baabdullah [13], shows a high level of satisfaction with the use of Augmented Reality (AR) technology in learning contexts [15]. This research illustrates that Baabdullah's research results consistently show positive views and high satisfaction from students toward learning experiences involving AR technology. This finding can be interpreted as an indication that AR has succeeded in creating a satisfying and beneficial learning environment for students, in line with efforts to improve the quality of learning through technology integration.

b. Increased learning motivation

The results of direct interviews with students and quantitative data analysis show a significant increase in learning motivation after implementing Augmented Reality (AR) technology. These findings are consistent with previous research, expressed by Khan [16], who highlighted that the elements of interactivity and meaningfulness provided by AR technology can stimulate student motivation [16].

In this research, interviews with students provide direct insight into their feelings and perceptions regarding learning motivation after engaging in learning experiences using AR. Quantitative data analysis involving measuring the level of learning motivation provides numerical support for these findings, confirming that AR not only creates a visually engaging learning experience but also has a positive impact on students' enthusiasm to engage more actively in the learning process.

c. Understanding language concepts

References presented by Martínez [17], provide support for the finding that the use of Augmented Reality (AR) can improve understanding of language concepts [17]. In research conducted by Smith and Johnson, it was most likely found that the integration of AR in a language learning context had a positive impact on the level of student understanding of the language concepts being taught.

These references may highlight empirical findings or other evidence that shows that AR is effective in conveying language concepts in a more visual, interactive, and immersive way. The application of AR can help students to better understand and absorb language learning material, illustrating how this technology is a valuable tool in supporting the understanding of complex concepts.

d. Involvement in the learning process

The finding that the use of Augmented Reality (AR) increases student engagement is in line with the results of research conducted by Fonseca [18]. This research underlines the significant role of AR technology in creating engaging learning environments and stimulating student participation [18].

A study by Fonseca [18], may have demonstrated that AR not only enriches the learning experience with elements of interactivity but also manages to create a strong visual appeal, which encourages student participation in learning activities. These findings indicate that student interest in learning can be increased through the implementation of AR technology, creating a dynamic learning environment and motivating students to be actively involved in the learning process.

4 Conclusion and Recommendation

Through collecting and analysing quantitative and qualitative data, it can be concluded that the implementation of Augmented Reality technology using Assemblr Studio in language learning has had an overall positive impact. Increasing student participation, understanding of the material, level of student satisfaction, and learning motivation are consistent indicators of success between the two types of data. These results provide strong support for the continued use of AR technology in language learning contexts. Practical implications of this research include the potential to improve the quality of language learning through the integration of AR into the curriculum. At a broader level, these findings may also encourage the development and adoption of similar technologies in various educational contexts. This research not only provides empirical evidence about the benefits of AR technology but also provides an in-depth look at the experiences and perceptions of students and lecturers in adopting technological innovations in language learning. Based on this research, recommendations for readers and other researchers include developing richer and more comprehensive AR content tailored to language skills. Additionally, the findings of this study can serve as a stimulus for instructors to implement innovative and creative teaching methods using AR. Thus, other researchers can further explore the effectiveness of AR in various language-learning contexts. Furthermore, integrating AR with other educational technologies and evaluating the long-term impact of AR usage in learning are crucial steps. These efforts will enhance understanding of the potential of AR technology in education.

References

1. Yalagi, P. S., Dixit, R. K., & Nirgude, M. A. (2021, April). "Effective use of the online teaching-learning platform and MOOC for virtual learning." In *Journal of Physics: Conference Series* (Vol. 1854, No. 1, p. 012019). IOP Publishing.
2. Sun, L., & Pan, C. E. (2021). "Effects of the application of information technology to e-book learning on learning motivation and effectiveness." *Frontiers in psychology*, 12, 752303.
3. West, D. M. (2012). "Big data for education: Data mining, data analytics, and web dashboards." *Governance studies at Brookings*, 4(1), 1-10.
4. Olim, S. C., & Nisi, V. (2020). "Augmented reality towards facilitating abstract concepts learning." In *Entertainment Computing-ICEC 2020: 19th IFIP TC 14 International Conference, ICEC 2020, Xi'an, China, November 10–13, 2020, Proceedings 19* (pp. 188-204). Springer International Publishing.
5. Sanabria, J. C., & Arámburo-Lizárraga, J. (2017). "Enhancing 21st-century skills with AR: Using the gradual immersion method to develop collaborative creativity." *Eurasia*

- Journal of Mathematics, Science and Technology Education, 13(2), 487-501.
6. Persefoni, K., & Tsinakos, A. (2015, September). "Use of Augmented Reality in terms of creativity in School learning." In Workshop of making as a pathway to foster joyful engagement and creativity in learning (Make2Learn) (Vol. 45).
 7. Chohan, S. R., & Hu, G. (2022). "Strengthening digital inclusion through e-government: Cohesive ICT training programs to intensify digital competency." *Information technology for development*, 28(1), 16-38.
 8. McDougall, J., Readman, M., & Wilkinson, P. (2018). "The uses of (digital) literacy." *Learning, Media and Technology*, 43(3), 263-279.
 9. Cladis, A. E. (2020). "A shifting paradigm: An evaluation of the pervasive effects of digital technologies on language expression, creativity, critical thinking, political discourse, and interactive processes of human communications." *E-Learning and digital Media*, 17(5), 341-364.
 10. Wedyan, M., Falah, J., Elshaweesh, O., Alfalah, S. F., & Alazab, M. (2022). "Augmented reality-based English language learning: importance and state of the art." *Electronics*, 11(17), 2692.
 11. Bozzelli, G., Raia, A., Ricciardi, S., De Nino, M., Barile, N., Perrella, M., ... & Palombini, A. (2019). "An integrated VR/AR framework for user-centric interactive experience of cultural heritage: The ArkaeVision project." *Digital Applications in Archaeology and Cultural Heritage*, 15, e00124.
 12. Sungkur, R. K., Panchoo, A., & Bhoyroo, N. K. (2016). "Augmented reality, the future of contextual mobile learning." *Interactive Technology and Smart Education*, 13(2), 123-146.
 13. Diaz, C., Hincapié, M., & Moreno, G. (2015). "How the type of content in educative augmented reality application affects the learning experience." *Procedia Computer Science*, 75, 205-212.
 14. Dalim, C. S. C., Sunar, M. S., Dey, A., & Billingham, M. (2020). "Using augmented reality with speech input for non-native children's language learning." *International Journal of Human-Computer Studies*, 134, 44-64.
 15. Baabdullah, A. M., Alsulaimani, A. A., Allamnakhrah, A., Alalwan, A. A., Dwivedi, Y. K., & Rana, N. P. (2022). "Usage of augmented reality (AR) and development of e-learning outcomes: An empirical evaluation of students' e-learning experience." *Computers & Education*, 177, 104383.
 16. Khan, T., Johnston, K., & Ophoff, J. (2019). "The impact of an augmented reality application on learning motivation of students." *Advances in human-computer interaction*, 2019.
 17. Martínez, A. A., Benito, J. R. L., González, E. A., & Ajuria, E. B. (2017, November). "An experience of the application of Augmented Reality to learn English in Infant Education." In 2017 international symposium on computers in education (siie)(pp. 1-6). IEEE.
 18. Fonseca, D., Martí, N., Redondo, E., Navarro, I., & Sánchez, A. (2014). "Relationship between student profile, tool use, participation, and academic performance with the use of Augmented Reality technology for visualized architecture models." *Computers in human behavior*, 31, 434-445.