

Innovation of Augmented Reality (AR) Technology Applications Android based for Learning Indonesian Language Especially Learning Literary Arts

*Novita Efendi, Diki Atmarizon

Universitas Negeri Padang, Indonesia
*E-mail: novitaefendi100@gmail.com

Received: 25 Apr. 2024, Revised: 12 May. 2024, Accepted: 30 May. 2024

ABSTRACT

The development of science and technology has brought significant progress in education. Traditionally, learning media for recognizing objects in children is often limited to books that only contain text and pictures, which often reduces interest in learning and increases boredom. However, with the emergence of Augmented Reality (AR), we can witness a technology that can integrate virtual objects into real environments in real-time. AR can help visualize concepts and understand an object's structure by projecting it in 2D or 3D. In a learning context, AR can be an exciting innovation, allowing children to not only read the text but also see three-dimensional objects accompanied by audio and translations in various languages, such as English, Indonesian, and Mandarin. The aim of developing AR applications in Android-based language learning is to improve the learning process and enrich students' interests by presenting interactive and entertaining content. This application development method includes the stages of conceptualization, design, material collection, assembly, testing, and distribution. The result of this research is a design for an AR application in language learning which is expected to continue to be improved to provide a better user experience.

Keywords: Innovation, Augmented Reality (AR), Android, Literary Arts.



This work is licensed under the Creative Commons Attribution-ShareAlike 4.0 International License

INTRODUCTION

In today's global world, Android phones are one of the most important tertiary demands. Android smartphones have been widely used by children to adults. We are here to create learning technology applications for junior high school students using Android phones because of today's technological sophistication. The use of technology is a form of mediator that helps the teaching and learning process by making communication between teachers and students more effective. This is very beneficial for teachers and makes it easier for students to hear and understand lectures. This process requires teachers to be able to bridge the gap between learning technology and learning methods (Hwang & Chien, 2022).

Technology use refers to the use and application of technology in different contexts and areas of life. This includes the use of any tool, software, system, or method designed to facilitate or enhance student activity at school (Riza et al., 2020). Utilizing technology can not only motivate students to study better but can also help them understand the subject

matter better. In this case, technology acts as a teaching tool used by teachers. For example, using graphics, films, presentations, and images, as well as computer or mobile learning. Its function is to record, process, and re-represent information visually and verbally.

Technology must provide real experiences, encourage learning motivation, and improve students' ability to understand and remember learning material as a teaching tool. Learning that only relies on textbooks is considered a boring learning method (Afif et al., 2022). The use of boxed books reduces the appeal of the process for children. We developed a learning application based on this challenge using AR technology based on Android phones. This is intended so that this procedure can increase students' interest in carrying out the learning process.

AR is being developed and can be used in a variety of real-world facilities and products. The latest trend and innovation in the mobile-based digital business sector is AR (Hwang & Chien, 2022). According to Dai et al (2022), this topic has not yet identified the use of AR in the real estate business. To compare app availability, use qualitative methods and data searches. A survey was conducted on the structural and technological considerations in the use of AR in the context of real estate establishments, as well as the barriers that may arise when adopting AR applications for the real estate sector. This research aims to create a compelling picture of AR applications and their commercial potential in future real estate development (Lotfi et al., 2022). Dwivedi et al (2022) leverage iPhone SDK 3.1, which has an application programming interface API to add overlapping layers for live video streaming from the camera and digital compass access. They use AR technology on the iPhone to help users find mountains. Using a digital compass allows for horizontal orientation of the phone, while the accelerometer provides vertical orientation information. This approach does not involve image or object recognition and relies on GPS or compass data for a simple mountain view via a web service. AR, according to Perry (2015) is "a continuum that includes completely real environments to purely virtual environments." Between these two extremes are AR (closer to the real world) and Augmented Virtuality (closer to the virtual world).

The importance of Android-based AR applications in learning materials is very striking. AR technology brings a new dimension to studying and understanding literary works in an interactive and fun way. With the AR application, students can directly experience visualizations of characters, context, and events in literary stories to understand and feel the story more deeply. It helps students connect emotionally with literary works, sparks imagination and creativity, and increases interest and motivation to study literature. AR applications can also help students understand abstract concepts that often appear in literary works more easily. By visualizing concepts visually and realistically, students can understand them more easily and develop a deeper understanding. In addition, the use of AR applications in literature learning also allows students to have a fun and interactive learning experience, which can increase student engagement and engagement in the

learning process. Therefore, Android-based AR applications have great potential to improve the efficiency of literature learning by providing a fun, engaging, and immersive learning experience for students.

METHODS

This research uses a literature study approach by analyzing various sources of information such as books and journals related to AR. It is hoped that the results of this analysis can help identify the effectiveness of using AR as a solution to learning Indonesian in the era of the Industrial Revolution 4.0.

RESULT

3.1 AR and Its Approaches

AR is a technology that combines virtual elements in the form of 2D and 3D virtual objects with real-world environments. This process is carried out directly or in real-time by projecting the virtual object into 2D and 3D form (Liu et al., 2016). Hapsari & Wulandari (2020) argue that AR has intrinsic benefits in terms of conveying experience and knowledge of the subjects studied. AR is a cutting-edge technology that inserts computer-generated content into an actual environment at a predetermined location. AR can bring digital content to the real world in the form of 2D and 3D animation (Perry, 2015).

AR can be understood as an integration between the real world and the virtual world. Compared to AR where objects or content in a real environment are transformed into a virtual environment, AR is a form of "mixed reality (MR)" where digital objects or objects in a virtual environment are brought into the real environment. In 1990, Thomas P. Caudell's article "The Term 'Augmented Reality'" (Liu et al., 2016) proposed the idea of AR for the first time. Three aspects show that the technology uses the concept of AR, namely:

- a) Blending real and virtual environments;
- b) Conveying information in a more interactive and real way, as if virtual objects were real; and
- c) Can display virtual objects in three dimensions.

Then obey (Ahdan et al., 2020), several main requirements make a device be categorized as an AR system, namely:

- a) There is a camera that is capable of recording video to capture live images;
- b) Has a reliable processor to combine virtual objects with real environments or to display 3D objects in real-time;
- c) Provides an interface that allows interaction between users with virtual objects and real objects.

According to the explanation above, AR is a technology that combines real and virtual objects in the same environment, thereby creating real-time interaction or the impression that the virtual object is real.(Hwang & Chien, 2022). This integration between the real world and the virtual world has a significant and relevant impact in certain contexts. AR allows users to visually see the real world or real objects, while text, photos, 3D models, films, sounds, and animations can be examples of virtual objects that can be included in an AR system. What's interesting is that these virtual objects are considered to exist or live in the real world. According to Lotfi et al (2022), Some literature shows that AR system technology can provide assistance and improve various learning methods. AR systems can support the following learning approaches:

- a) Constructivist learning, where AR technology is used to involve students in the learning process. Students can learn and connect basic or existing knowledge;
- b) Situation-based learning, if learning supports real-world educational experiences and integrates real-world environments into the classroom, students can feel it;
- c) Game-based learning (games-based learning), AR systems can be used to facilitate interesting game-based learning. By building digital narratives first, students can be placed in specific roles and develop relevant contextual knowledge. AR can change the real world into a virtual world, where the games played can help students apply knowledge to the real world more simply and easily;
- d) Inquiry-based learning. In inquiry-based learning, AR systems allow for virtual models that can be manipulated and displayed in real-world settings. AR also helps in conducting investigations by providing relevant and contextual information about the topic being discussed.

3.2 The Impact of Using AR Technology in Literary Arts Learning

According to research by Perry (2015) along with changing times, technology continues to develop rapidly, including AR technology which offers interesting visual experiences for students and can raise enthusiasm in the learning environment. The use of AR technology can increase motivation and the learning process and reduce anxiety that students may feel. Students who have high motivation will be more actively involved in learning activities, which in turn contributes to improving the learning process. This is an important factor in the learning process (Handoko & Waskito, 2018). Previous learning failures can result in a lack of interest and desire to learn, leading to greater worry about learning and lower self-confidence (Sulistiyorini, 2022). Application of Keller's ARCS model (Attention, Relevance, Confidence, and Satisfaction) in learning design that uses technology, such as AR technology, can improve the quality of learning. This model consists of four components:

- a) Attracting students' attention by using appropriate design, learning materials, or media can motivate them to investigate and understand learning more deeply (Perry, 2015).

- b) Accuracy. Learners will be more motivated if the content is relevant to their goals, needs, and experiences (Perry, 2015).
- c) Confidence. The more successful a learning experience, the more motivated students will be to improve their learning performance (Perry, 2015).
- d) Satisfaction. Students will be more motivated if they believe their learning experience is good and useful (Perry, 2015).

The use of AR technology in literature learning has had a significant impact. AR provides a richer and more interactive learning experience for students. By using AR, students can see and visually interact with literary elements in their real environment. This helps students better understand and appreciate the stories, characters, and settings of literary works. Children can explore the world of literature in a more fun and interesting way, which increases their interest and motivation to learn literature. Apart from that, AR also allows students to explore the historical, cultural, and social context surrounding literary works. They can relate literary works to real-world situations, enriching their understanding of the values and messages contained in stories. The use of AR in literature learning not only enriches students' learning experiences but also increases their understanding of literary works comprehensively.

3.3 Innovation and Development of Android-based AR Technology in Indonesian Language Learning, especially Literary Arts

The use of AR technology in literature studies has brought great convenience and benefits. AR provides students with an interactive and immersive learning experience. Using a compatible device, such as a smartphone or tablet, students can easily access AR applications or platforms that present literary content visually and bring characters and stories of literary works to life. One of the benefits that AR brings is freedom of space and time. Students are no longer limited to certain classes or study times. They can explore the world of literature with works from different eras and cultures without leaving their seats. AR allows students to visualize literary characters, story contexts, and live situations, thereby increasing understanding and a sense of participation in the literature being studied. Additionally, AR facilitates diverse and interesting learning methods. Students can utilize AR features to read, listen, and view important parts of a story, poem, or drama. They can see illustrations and animations come to life, hear dialogue delivered by characters in literary works, or even interact directly with the characters. All this makes literature learning more interesting, fun, and relevant for students. AR also allows collaboration and interaction between students in the learning process. They can work together to create virtual literary environments, adapt stories into mini-stages, or even create their literary masterpieces using AR elements. Learning becomes more dynamic and inspiring, where students can share ideas, provide feedback, and learn from other people's experiences.

In general, the use of AR technology in literature learning brings considerable convenience. With intuitive interactions that bring literature to life, seamless access to works from different eras and cultures, and creative and collaborative learning experiences, students can understand and explore literature in engaging and creative ways. AR has opened new doors for learning and enjoying literature, making literature learning more interesting and relevant in the digital era. Ahdan et al (2020) application of a development model that follows a development research approach with six stages, namely needs analysis, multimedia learning design, validation by experts, revision, and product testing, which is the procedure used in developing multimedia learning. The multimodal development model according to Dai et al (2022) can be summarized as follows:

1. Analysis Stage

In this case, software development goals are set for students, teachers, and the environment. The analysis was carried out in partnership with teachers for this reason and is still consistent with the curriculum. Software development needs analysis is required in addition to objective analysis. The first stage is requirements analysis, which serves as the basis for the subsequent software development process. The results of this need analysis determine the smoothness of the entire software development process and the completeness of the resulting software functions.

2. Design Stage

This stage includes determining the aspects that must be present in the learning technology that will be produced following the learning design which is also called the ID (Instructional Design) model. This step produces a storyboard that shows how the multimedia will be displayed (interfacing). Some of the elements contained in this step include material presentation, 3D models for learning, animation, and evaluation. Apart from that, the result of this stage is a flowchart that describes the interactive multimedia learning system from start to finish. During this procedure, data such as the design that will be displayed on the desired learning media application is collected.

3. Development Stage

This step includes creating learning media based on storyboards, creating media such as 3D models and animations for evaluation, creating stories, integrating all these components, and designing the program. After that, an assessment is carried out by experts (judgment). This evaluation includes interface, text, 3D models, interactivity, and learning materials. After the design stage is complete, the next step is development, which produces a learning technology application that can be used on the Android platform.

4. Feasibility Analysis Stage

This analysis is carried out to verify the suitability of the application to be developed. Technological suitability, legal suitability, and operational suitability are aspects that are the focus of feasibility research.

Technology Feasibility Analysis

For the following reasons, the application to be built is technologically feasible:

- The use of AR technology in the context of learning media, especially in Indonesia, is still at an early stage. Therefore, the development and application of this technology have very interesting potential, especially because it is supported by available tools and is very possible to use it in the world of education;
- The availability of users, especially teachers at the junior high school level, to use this learning media application is very important.

Legal Feasibility Analysis

- The legality of the software that will be used in making applications determines its legal validity. One legitimate program is Autodesk Maya, which is free and open-source 3D design software. This program is used to create animated films, visual effects, 3D printed objects, interactive 3D applications, and video games. The features included in Autodesk Maya include modeling, texturing, rigging or animation, and 3D rendering.
- Unity 3D is an open-source game engine software that is widely used in game development. Game engines are software used to create games, and are now increasingly used to develop AR applications. Unity 3D has legal validity as legitimate software.
- Vuforia is legal and free software used to display 3D models on special markers. This is a plugin specifically designed for the use of AR technology.

Operational Feasibility Analysis

The application that will be created can be implemented according to research targets after considering many operational supporting factors. These elements include:

- The teacher's ability to use this tool, so no additional training is needed to use it.
- The application may malfunction in the following situations: 1) When the marker being read is not clear and the lighting conditions are poor, the marker reading may not work well; and 2) If the supporting device used does not support the application being built, an error may appear

After carrying out the steps above, Android-based AR technology can be created for learning Indonesian, especially literature. The "Sastra AR" application is an example of an Android-based AR technology application that is innovative and continues to develop in learning Indonesian, especially literature. This application is designed to combine literary elements in Indonesian with AR technology, thereby creating an interactive and immersive

learning experience. The following are the features of the Sastra AR application that we can play within the learning process:

- Presenting literary works in visual form: This app allows students to view literary works, such as short stories, poetry, or drama, in expanded visual form via AR. Students can view literary texts in an engaging format and include additional visual elements, such as pictures, illustrations, or animations to bring the story to life.
- Literary characters live: The Sastra AR application uses AR technology to introduce characters in literary works into the real world. Students can see these characters interacting around them, talking or taking actions related to the story. This provides a more immersive experience and allows students to feel the atmosphere and emotions contained in literary works.
- Analysis and interpretation of literary works: This application provides literary analysis and interpretation features integrated with AR technology. Students can highlight important passages of the text, view notes or comments on interpretations, and access additional content, such as literary interpretations, symbolic interpretations, or historical contexts related to literary works.
- Reading comprehension practice: The Sastra AR application also offers interactive reading comprehension exercises. Students can answer questions or take quizzes related to the story or theme of a literary work. Students' responses are assessed in real time and they receive immediate feedback on their understanding of the literary works studied.
- Collaboration and discussion: This application provides collaboration and discussion features between students. Students can share their thoughts, ideas, or interpretations of literary works with other students through the comments feature or discussion forum in the application. This allows literature students to interact and exchange ideas more actively.

Steps that can be used in creating AR technology in literature learning:

- Determine learning objectives. Identify the learning objectives to be achieved through the application of AR in learning materials. For example, increasing students' understanding of literary characters or creating an immersive experience when reading literary works.
- Select platform and device. Decide which platform to use, such as Android, and which devices to target the AR app.
- Researching AR technology. Learn which AR technologies to use, such as ARCore for the Android platform, and gain a basic understanding of how AR works.
- Planning AR content. Identify the literary content that will be integrated into the AR application, such as key characters, settings, or objects from the literary work that you want to present visually.
- Configure media resources. Collect the necessary multimedia content, such as images, sounds, and 3D models that correspond to the identified literary content.

- Interactive design. Create conceptual designs for users to interact with AR applications, such as UI/UX views, navigation, and interaction methods that align with learning objectives.
- Application development. Start developing AR applications using programming languages suitable for the Android platform and selected AR technology. Use frameworks and development tools that help build AR applications.
- Content and AR integration. Integrate literary content prepared using AR technology, such as by placing virtual characters around the user or visualizing the background of a literary work.
- Try it and rate it. Test the app by engaging potential users, such as students or teachers, and collect feedback to refine and improve the app.
- Launch and support. Once the application is said to be ready, use it and provide technical and maintenance support for the AR application in literature learning.

CONCLUSIONS

The use of AR technology is very useful as a means of interactive and hands-on learning for students. The use of augmented reality learning media can increase students' interest in learning because it directly combines elements of the virtual world with the real world, so it can stimulate their imagination. The presence of interactive AR allows students to experience learning situations more realistically and also helps visualize the concepts taught by the teacher. From this discussion, the use of Android-based AR science learning media should be further developed for other topics or materials to make it interesting and more cooperative. Therefore, facing the era of Industrial Revolution 4.0 not only requires motivation but also requires special and diligent efforts from the Indonesian Government and the entire community to welcome the digital era. Even though the process of technological transformation and innovation still has many challenges, we must be ready and brave to overcome them so as not to be overwhelmed by the Industrial Revolution 4.0.

ACKNOWLEDGMENTS

I would like to thank the related parties who have helped write and publish this article 1) Prof. Dr. Hasanuddin WS, M. Hum. as promotor in writing this research paper; and 2) Dr. Abdurrahman, M. Pd. as the co promotor for writing this article.

REFERENCES

- Afif, N., Ayuningrum, D., Imran, A., & Qowim, AN (2022). Curriculum Development Innovation with a Scientific Approach for RA/PAUD in Banten Province. *Islamic Education: Journal of Islamic Education*, 11(01), 79. <https://doi.org/10.30868/ei.v11i01.2244>
- Ahdan, S., Priandika, A., Andhika, F., & Amalia, FS (2020). Designing Learning Media for Basic Volleyball Techniques Using Android-Based Augmented Reality Technology. *Research Journal*, 8(3), 221–236. <https://docplayer.info/210712569-Perancangan-media-pembelajaran-teknik-dasar-bola-voli-menusing-technology-augmented-reality-based-android.html>
- Dai, L., Jung, M.M., Postma, M., & Louwense, M.M. (2022). A systematic review of pedagogical agent research: Similarities, differences and unexplored aspects. *Computers and Education*, 190 (August), 104607. <https://doi.org/10.1016/j.compedu.2022.104607>
- Dwivedi, Y.K., Hughes, L., Baabdullah, AM, Ribeiro-Navarrete, S., Giannakis, M., Al-Debei, MM, Dennehy, D., Metri, B., Buhalis, D., Cheung, CMK, Conboy, K., Doyle, R., Dubey, R., Dutot, V., Felix, R., Goyal, D.P., Gustafsson, A., Hinsch, C., Jebabli, I., ... Wamba, SF (2022). Metaverse beyond the hype: Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 66(July), 102542. <https://doi.org/10.1016/j.ijinfomgt.2022.102542>
- Handoko, H., & Waskito, W. (2018). Blended Learning: Concept and Application. In *Blended Learning: Concepts and Applications* (Vol. 5, Issue 2). <https://doi.org/10.25077/car.64.60>
- Hapsari, TPRN, & Wulandari, A. (2020). Feasibility Analysis of Millennial Textbooks Based on Augmented Reality (AR) as a Media for Learning Procedure Texts in Magelang. *Diglossia: Journal of the Study of Language, Literature and Teaching*, 3(4), 351–364. <https://doi.org/10.30872/diglossia.v3i4.125>
- Hwang, G. J., & Chien, S. Y. (2022). Definition, roles, and potential research issues of the metaverse in education: An artificial intelligence perspective. *Computers and Education: Artificial Intelligence*, 3(April), 100082. <https://doi.org/10.1016/j.caeai.2022.100082>
- Liu, Y., Holden, D., & Zheng, D. (2016). Analyzing students' Language Learning Experience in an Augmented Reality Mobile Game: An Exploration of an Emergent Learning Environment. *Procedia - Social and Behavioral Sciences*, 228(June), 369–374. <https://doi.org/10.1016/j.sbspro.2016.07.055>
- Lotfi, M., Osório, G.J., Javadi, M.S., El Moursi, M.S., Monteiro, C., & Catalão, J.P.S. (2022). A fully decentralized machine learning algorithm for optimal power flow with cooperative information exchange. *International Journal of Electrical Power and Energy Systems*, 139(December 2021). <https://doi.org/10.1016/j.ijepes.2022.107990>

- Perry, B. (2015). Gamifying French Language Learning: A Case Study Examining a Quest-based, Augmented Reality Mobile Learning-tool. *Procedia - Social and Behavioral Sciences*, 174, 2308–2315. <https://doi.org/10.1016/j.sbspro.2015.01.892>
- Riza, M., Kartono, & Susilaningiha, E. (2020). Study of Project Based Learning (PjBL) on Conditions Before and during the Covid-19 Pandemic. *2020 National Postgraduate Seminar*, 3(1), 236–241. <https://proceeding.unnes.ac.id/index.php/snpasca/article/view/617>
- Sulistiyorini, NE (2022). Application of Cooperative Learning in Teaching Speaking on Asking for and Giving Opinion Material. *WUNY Scientific Journal*, 3(2), 51–60. <https://doi.org/10.21831/jwuny.v3i2.43083>