

Analysis of Opportunities and Challenges of Augmented Reality Media in Learning

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Abstract

The technology known as Augmented Reality (AR) enables interactive and innovative learning experiences by integrating digital objects into the real world in real-time. The aim of this research is to evaluate how effectively AR is used in learning in elementary schools using a literature study approach. The research results show that the use of augmented reality (AR) increases student participation, encouragement and understanding of learning material. AR makes it easier to convey abstract concepts through real-world visualizations, improving learning outcomes by up to 20%, and increasing students' ability to collaborate and think critically. However, problems such as limited infrastructure and difficulty gaining access to technology continue to be major obstacles. For future development, it is recommended that teachers be trained in the use of AR to increase the effectiveness of its implementation. Overall, there is a strong possibility that AR technology can help improve the quality of learning in elementary schools.

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1. INTRODUCTION

Augmented Reality (AR) is proof of the increasing development of technology. AR is a technology that integrates digital objects, both two-dimensional and three-dimensional, into the real world in real-time, enabling user interaction with the surrounding environment. It was first introduced by Thomas Caudell and David Mizell in 1990, but the AR concept has been around since the 1950s with discoveries such as Sensorema by Morton Heiligh. AR projects the virtual world onto the physical world, helping users' complete tasks with information from virtual objects. Types of AR include Marker Based, Markerless, Projection Based, and Superimposition Based Augmented Reality. in an educational context, AR provides a great opportunity to improve the quality and accessibility of learning. With its ability to realize visual material in a real way, AR is an innovative and effective teaching method, encouraging students to be more actively involved in the teaching and learning process.

2. METHOD

The research method used in this review uses the Literature Study method. This is done by searching for information through books and other literary journals with the aim of forming a theoretical basis. The analysis process begins with categorization, where information will be grouped based on themes or topics that are relevant to the research. Next, synthesis is carried out by combining findings from various sources to provide a comprehensive picture. Finally, interpretation of the analysis results will help us draw conclusions about its effectiveness and challenges. To ensure the validity and reliability of this research, we will use credible and

reliable data sources such as national and international articles. We will also triangulate the data by comparing information from various sources to ensure consistency of findings.

3. RESULTS AND DISCUSSION

The use of Augmented Reality (AR) technology in the classroom has shown that students are more involved in learning activities. Because AR provides an interesting visual and interactive experience, research by Sari and Permana (2022) found that the visual appeal of virtual objects produced by AR made students more engaged and encouraged them to ask questions and talk more in class.

Use of New AR Technology Increases Learning Motivation Increases Student Participation and Motivation. When innovative technology helps them learn, normally passive students feel more motivated. Setiawan and Anwar (2023) show that using interesting media that they have never experienced makes students more motivated and challenged to learn new material. AR naturally increases students' intrinsic motivation with surprise and novelty. This is an important component for achieving optimal learning outcomes.

Simplifying Abstract Concepts for Students to Understand Them For example, by using 3D models, ideas such as the human circulatory system or the solar system can be depicted realistically. This makes it easier for students to understand its structure and function. Arifin (2023) stated that AR is very helpful in explaining difficult concepts, especially for elementary school students, who find it easier to understand visualizations than verbal descriptions. By visualizing abstract material, students can remember and understand topics more easily, which contributes to increasing their knowledge.

Impact on Overall Student Learning Outcomes: The use of AR also has a significant impact on improving student learning outcomes. Data collected from evaluation tests carried out after using AR showed that, compared to conventional learning methods, students' grades increased by 20%. Rahma and Purnama (2022) found that AR has the ability to improve student academic achievement by offering a more in-depth and effective learning experience. Students are better able to remember information with clear and interactive visualizations. This increases the value.

Development of Critical Thinking Skills Through Augmented Reality: Augmented reality can help students improve their critical thinking skills in addition to increasing their understanding. By using it, students are asked to examine the information presented and make conclusions based on the visualizations they see. Kusuma (2023) states that AR encourages students to think critically and question the ideas they learn. Ultimately, this helps them develop problem-solving and critical thinking skills, both of which are critical to future academic success.

AR technology allows for better student-teacher interaction and a more interactive classroom atmosphere. As a result, teachers can more easily communicate with students and provide more contextual learning guidance. Because students tend to be more open to asking questions about the virtual objects they see, Hidayat and Sulis (2023) saw that when AR was used, student and teacher interaction increased. Additionally, explaining concepts visually becomes easier for teachers, which accelerates student understanding and encourages more interactive learning.

With AR, collaborative learning between students not only improves individual students' skills, but also encourages collaboration between students. Virtual object exploration assignments encourage students to work together in groups, share knowledge, and talk about the topic being studied. Yusuf and Dewi (2022) show that when AR is used in collaborative learning, it encourages students to share ideas and knowledge. In this way, communication and cooperation skills that are important for the learning process are improved.

Students respond well to the use of AR in learning. They enjoy the material more and don't get bored with it. AR makes students' learning experiences different from others, making them more involved (Sari and Permana, 2022). Compared to traditional learning approaches, the classroom atmosphere is livelier, and students tend to be more motivated to learn.

Limitations in Using AR Technology However, the use of augmented reality (AR) in elementary schools faces several challenges, especially regarding the infrastructure and

technological devices required. In some schools, for example, students cannot enjoy the same learning experience with tablets or AR glasses. Anwar (2023) states that these limitations are still a major obstacle to education, especially in schools that are located in remote areas and do not have easy access to modern technology.

Recommendations for Future Development of AR Implementation: Teachers must be specifically trained to utilize AR well. Setiawan (2023) proposed that schools should provide training to teachers to learn how AR works and how to combine it with appropriate learning approaches. With good training, teachers are expected to be able to create a more interactive and beneficial learning experience for students. This will help them achieve their learning goals more efficiently.

Overall, the application of Augmented Reality technology in elementary school learning shows a significant increase in student participation and desire to learn. Not only are students more actively engaged with AR, they are also more motivated to learn about complex and abstract things, and this technology helps students collaborate in class and improve their critical thinking skills. Although there are still obstacles, especially those related to infrastructure and teacher training, AR has great potential to be implemented more widely in the future. AR can be an innovative way to improve the quality of basic education if it is planned well and supported by facilities.

4. CONCLUSION

The use of Augmented Reality (AR) technology in basic education shows significant improvements in student engagement, motivation and learning outcomes. AR helps simplify abstract concepts, encourage collaboration, and improve critical thinking skills.

5. SUGGESTION

Despite challenges related to infrastructure and training, AR's potential to improve the quality of education is enormous if implemented well.

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