THE EFFECT OF THE USE OF AUGMENTED REALITY (AR) MEDIA ON STUDENT LEARNING OUTCOMES IN THE SUBJECT OF SCIENCE IN GRADE X AT SMA MUHAMMADIYAH LEMPANGANG, BAJENG DISTRICT, GOWA REGENCY

Muh Arif FIQRI[1], Nasir NASIR[2], Nurindah NURINDAH[3]

[1,2,3]Educational Technology Study Program, Faculty of Teacher Training and Education, Muhammadiyah University of Makassar, Indonesia

Corresponding author: Muh Arif Fiqri

Email: arif@gmail.com

Abstract:

The main problem in this study is the effect of the use of Augmented Reality (AR) media on student learning outcomes in science subjects for class X at SMA Muhammadiyah Lempangang, Bajeng District, Gowa Regency. This study aims to determine whether there is an effect of the use of Augmented Reality (AR) media on student learning outcomes in science subjects for class X as intended. The type of research used in this study is a quantitative research type with an experimental method approach (pre-experiment), a one-group pretest-posttest model. The analysis technique is in the form of Descriptive and inferential statistics with the help of SPSS. The subjects in this study were 15 students of class X at SMA Muhammadiyah Lempangang, Bajeng District, Gowa Regency. Based on the results of the study, the results of inferential analysis with calculations using SPSS version 26 showed that the pretest and posttest data had met the normality test. It is a prerequisite test before conducting a hypothesis test. The pretest and posttest data were normally distributed because the p-value $\geq \alpha = 0.05$. The inferential analysis shows that student learning outcomes are normally distributed (sig. > 0.05). The results also indicate that Augmented Reality (AR) media positively influences science learning outcomes of grade X students at SMA Muhammadiyah Lempangang. This is supported by a significance value of 0.000 < 0.05, indicating H0 is rejected and H1 is accepted.

Keywords: Augmented Reality, Learning Outcomes, Science

INTRODUCTION

Education is a key element in advancing a nation. As a nation governed by the rule of law, Indonesia prioritizes education as the primary foundation for achieving progress. According to a UNESCO report, Indonesia's education quality is ranked 64th internationally out of 120 countries. This is due to its poor education system. The low quality of Indonesia's education system is evident in the weak educational management sector, the imbalance between educational facilities and infrastructure in some urban and rural areas, the lack of government support, and the very low standards of learning evaluation (Safitri et al., 2022).

Learning media is a crucial element in the learning process. According to Mashuri (2019), learning media is something that conveys learning materials and stimulates students' thoughts, feelings, interests, and attention. Therefore, the use of learning media can convey what teachers are unable to verbalize. This allows the abstractness of the material to be concretized through the use of learning media. This can help achieve learning objectives and outcomes. The use of learning media is one of the most crucial elements in the educational process. The success or failure of learning is largely determined by the media used, making innovation in education an unavoidable necessity. Therefore, teachers must be able to modify learning models and media in a targeted manner so that students understand them, thus achieving the best results (Octavia, 2020). According to Nurindah

(2021), one factor in successful learning is the teacher's mastery of the use of technology in learning. This is because the development of learning media will continue to experience innovation and renewal, such as learning media based on Augmented Reality, Virtual Reality, Mixed Reality, and 3D holograms.

Augmented Reality (AR) is a technology that projects virtual objects into the real world. According to Pradana (2020), the advantage of the Augmented Reality (AR) method is that it can display more engaging visuals with three-dimensional objects that appear to exist in a real environment. Therefore, learning media such as Augmented Reality (AR) can be applied to school subjects, including Natural Science (IPA). Research conducted by Mansur (2023) demonstrated that the use of Augmented Reality (AR) media in learning can help students understand various materials and concepts effectively and improve learning outcomes across cognitive, affective, and psychomotor domains. Further research by Kamaruddin and Tahir (2021) also demonstrated that Augmented Reality-based learning significantly improves student learning outcomes.

Based on the results of initial observations in science subjects at SMA Muhammadiyah Lempangang conducted on Monday, September 9, 2024, it was found that many students obtained scores below the KKM set by the school, which is 70%. The data shows that most students have not achieved the ideal score, which is above 75. This situation is caused by the use of learning media that has not been optimally utilized. As a result, students feel bored and have difficulty concentrating during the learning process, which has a negative impact on their learning outcomes. Through Augmented Reality (AR) learning media, it is hoped that students can carry out virtual practicums by viewing objects as they are in real form in three dimensions, thus providing a more realistic and immersive learning experience. This is very suitable for implementation at SMA Muhammadiyah Lempangang to improve the quality of learning and student understanding so that learning outcomes can be achieved.

METHODS

The type of research used in this study is quantitative research that emphasizes its analysis of numerical data (numbers) processed by statistical methods. This study also uses the Pre-Experimental Design approach, namely a research method carried out on a group, with the form of a One Group Pretest Posttest Design where before being given treatment, an initial test (pretest) is first given and then retested with the same test questions as a final test (posttest) (Sugiyono, 2017: 109-110). This treatment is to determine the Effect of Using Augmented Reality (AR) Media on Student Learning Outcomes in the subject of science class X at SMA Muhammadiyah Lempangang, Bajeng District, Gowa Regency.

RESULT AND DISCUSSION

The data analysis results for this research are based on data obtained from a study entitled "The Effect of Augmented Reality Media Use on Science Learning Outcomes for Tenth-Grade Students at SMA Muhammadiyah Lempangang, Bajeng District, Gowa Regency." This research was conducted from May 9 to July 9, 2025, at SMA Muhammadiyah Lempangang, Jl. Poros Panciro, Bajeng District, Gowa Regency. The research began with a visit to the school and a meeting with the principal, Ms. Sunarti R, S.Pd., G.r., to obtain a research permit.

This study used a sample of 15 tenth-grade students. The research process was conducted over five sessions. The first session provided a pretest to measure students' science abilities. The second session introduced the Augmented Reality (AR) application. The third and fourth sessions implemented the Augmented Reality (AR) media in the tenth-grade classroom. The fifth session

provided a posttest to measure student learning outcomes after using the Augmented Reality (AR) media.

Discussion of Descriptive Statistical Analysis Results; Student Learning Activities. Observation data on student learning activities in science conducted by 10th-grade students at SMA Muhammadiyah Lempangang, consisting of 15 students, showed excellent engagement in three meetings. The Good category was achieved in two of the five meetings, indicating that the percentage of student learning activity in the lesson had been achieved. Notable learning activities included students actively paying attention to teacher explanations, demonstrating interest in planetary objects through Augmented Reality (AR) media, and regularly completing and submitting assignments. Overall, the use of Augmented Reality (AR)-based learning media has been proven to enhance student learning activities in science. According to Hamalik (2014), increased student learning activities result from providing opportunities for direct learning activities during the learning process, thus effectively demonstrating effective learning. After engaging in a series of classroom learning activities, students will experience changes within themselves. These changes reflect the learning outcomes gained during the learning process and evaluation.

Using Augmented Reality (AR). Augmented Reality (AR) is an interactive technology capable of combining real and virtual objects to create three-dimensional (3D) objects that can be viewed on a smartphone screen. The use of Augmented Reality (AR)-based learning media can be an alternative tool to help teachers deliver learning materials more engagingly, particularly in science subjects, which are often difficult to understand when presented purely theoretically. Therefore, media that can display engaging images, complete with captions, animations, or videos, is needed. This allows students to become more active, creative, and understand the subject matter, which can improve student learning outcomes.

Research data from the pretest, conducted on 15 students, showed that the majority of students (10) were in the Low category (scores 46–75). Four students were in the Medium category (scores 76–85), and only one student was in the Very Low category (scores 0–45). No students reached the High category (scores 86–95) or Very High category (scores 96–100). After the posttest, conducted on 15 students, the number of students in the High category (scores 86–95) increased to six, and the number of students in the Medium category increased to five. Meanwhile, the number of students in the Low category decreased to three, and the number of students in the Very Low category remained at one.

Furthermore, the results of calculations using SPSS on the pre-treatment (pretest) data for 10th-grade students yielded a valid sample size of 15, with an average score of 68.00, a standard deviation of 14.368, a minimum score of 25, and a maximum score of 85. Meanwhile, the results of calculations on the post-treatment (posttest) data yielded a valid sample size of 15, with an average score of 80.33, a standard deviation of 14.573, a minimum score of 35, and a maximum score of 90. Based on these data, during the learning process, there was a visible difference between before and after using Augmented Reality (AR) media, indicating an increase in student learning outcomes in science.

Discussion of Inferential Statistical Analysis Results. The results of the inferential statistical analysis referred to are the results of the previous tests. Researchers conducted tests in the form of normality tests, homogeneity tests, and hypothesis tests. The results of inferential statistical analysis showed significant results with learning outcomes above the KKM value after using Augmented Reality (AR) media in science learning. Thus, H0 is rejected and H1 is accepted because the average student learning outcomes reach the predetermined KKM value of 75; this result can be said to be positive. So, there is an influence of the use of Augmented Reality (AR) media on student learning outcomes.

The use of Augmented Reality (AR) media in classroom learning is highly beneficial for both students and teachers. It makes students more active in the learning process. Learning becomes more enjoyable due to the presence of interesting features that can visualize abstract concepts of the structure of an object model, especially in science subjects. Therefore, student activeness in the learning process can help improve learning outcomes.

A study conducted by Rismawati Kamaruddin and Rahmatia Thahir entitled "The Effect of Augmented Reality (AR)-Based Learning Media on High School Students' Biology Learning Outcomes" showed that classes taught using Augmented Reality (AR)-based learning media achieved an average learning outcome of 80, while classes taught using media commonly used by subject teachers achieved an average learning outcome of 73. The learning completion rate of students in the experimental class was 86.1%, while the learning completion rate of students in the control class was 47.2%. These results indicate an impact on student learning outcomes, as evidenced by an Independent Samples T-Test with a significance value of $p = 0.001 < \alpha = 0.05$. Therefore, H0 is rejected and H1 is accepted. Therefore, Augmented Reality (AR)-based learning media has an impact on student learning outcomes in the topic of viruses in grade 10 at SMA Negeri 1 Gowa.

In a study conducted by Liono et al., they found that Augmented Reality (AR) can improve student learning performance compared to traditional teaching materials. Augmented Reality (AR) media is also more effective in enhancing student learning and motivation, as well as aiding understanding of abstract concepts. Furthermore, Augmented Reality (AR) technology can assist students with challenging learning experiences and tends to present content that makes learning practical.

Based on the results of the descriptive and inferential statistical analyses obtained, as well as the results of field observations, it can be concluded that Augmented Reality (AR) learning media has an impact on student learning outcomes in the science subject, specifically the Solar System, in grade 10 at SMA Muhammadiyah Lempangang.

CONCLUSION

Based on the results of the study, the results of inferential analysis with calculations using SPSS version 26 show that the pretest and posttest data have met the normality test. This is a prerequisite test before conducting a hypothesis test. The pretest and posttest data have been normally distributed because the p-value$\geq \alpha = 0.05$. The results of the inferential analysis show that the average score of students' learning interest is normally distributed because the significance is greater than 0.05. From the results of the descriptive and inferential analysis obtained, it turns out that Augmented Reality (AR) learning media influences student learning outcomes in the science subject of class X at SMA Muhammadiyah Lempangang, providing a positive and more effective impact, so that students are more active in the teaching and learning process. This can be seen from the significance level = 0.05 and degrees of freedom (df) = 14 from the distribution table 176.131 with the results of the t-count calculation < from the t-table or 2.114 < 176.131, thus, H1 is accepted and H0 is rejected.

REFERENCES

Arimbawa, I. G. A. I. M., Indiani, N. L. P., & Surasmi, I. A. (2025). The Role of Job Satisfaction in Mediating the Influence of Work Environment and Work Motivation on Employee Performance at Agung Bali Souvenirs in Badung, Bali. *International Journal of Environmental, Sustainability, and Social Science*, *6*(3), 441-461.

Gulo, S., & Pranoto, P. (2025). Digital Promotion Strategy Analysis in Developing Bukit Cinta Rawa Pening Tourist Destination: A Perspective of Managers and Business Actors. *Journal of Tourism Economics and Policy*, *5*(3), 338-354. https://doi.org/10.38142/jtep.v5i3.1339

Kamaruddin, R., Rahmawati, T. (2021), Pengaruh Media Pembelajaran Berbasis Augmented Reality (AR) Terhadap Hasil Belajar Biologi Siswa SMA. *JRIP: Jurnal Riset dan Inovasi Pembelajaran, 1*(2). https://doi.org/10.51574/jrip.v1i2.26

Mashuri, S. (2019). *Media Pembelajaran Matematika.* Yogyakarta: Deepublish.

Nurindah, K. (2021). Implementasi Media Pembelajaran Berbasis Android Terhadap Hasil Belajar Bahasa Indonesia. *Akademika Jurnal Teknologi Pendidikan, 10*(1), 1-12. https://doi.org/10.34005/akademika.v10i01.1311

Pariasa, I. W. (2025). The Effect of Work Discipline and Financial Motivation on Employee Performance with Organizational Commitment as a Mediating Variable at Putra Celagi Rolling Pork in Bali. *International Journal of Environmental, Sustainability, and Social Science*, *6*(3), 507-520.

Pradana, R. W. (2020) Penggunaan Augmented Reality Pada Sekolah Menengah Atas Indonesia. *Jurnal Teknologi Pendidikan, 5*(1). https://doi.org/10.33394/jtp.v5i1.2857

Sari, I. G. A. A. I., Purnamawati, I. A. P. S., & Putri, S. T. G. (2025). Strengthening MSMES in Tabanan Through Beaded Accessory Craft: Product Design Development and Digital Marketing Assistance. *Akuntansi dan Humaniora: Jurnal Pengabdian Masyarakat*, *4*(1), 01-05. https://doi.org/10.38142/ahjpm.v4i1.1392

Safitri, A. O., Yunianti, V. D., & Rostika, D. (2022). Upaya Peningkatan Pendidikan Berkualitas Di Indonesia: Analisis Pencapaian Sustainable Development Goals (Sdgs). *Journal Basicedu, 6*(4), 7096–7106. https://doi.org/10.31004/basicedu.v6i4.3296

Sumadi, A. S., & Bayunitri, B. I. (2025). The Impact of Internal Audit in the Case of PT. Xyz Bandung Regency on the Effectiveness of Internal Control. *Journal of Governance, Taxation and Auditing*, *3*(3), 108-119. https://doi.org/10.38142/jogta.v3i3.1405