

The Effect of Augmented Reality (AR) Media Based on Assemblr Edu on Learning Outcomes in Natural and Social Sciences (IPAS) on Cultural Diversity Material for Fourth-Grade Students at SDN Mangkubumi

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Abstract

This study was motivated by the low learning outcomes of fourth-grade students at SDN Mangkubumi in the subject of Natural and Social Sciences (IPAS), particularly on the topic of Cultural Diversity. This condition was caused by the use of less varied instructional media, making it difficult for students to understand learning materials requiring concrete visualization. This study aimed to determine the effect of Augmented Reality (AR) media based on Assemblr Edu on students' learning outcomes in IPAS on the topic of Cultural Diversity.

This study employed a quasi-experimental method using a Nonequivalent Control Group Design. The population consisted of all fourth-grade students at SDN Mangkubumi, totaling 30 students. Saturated sampling (total sampling) was used, with 15 students assigned to the experimental group and 15 students to the control group. Data were collected through pretests and posttests consisting of 20 validated and reliable multiple-choice questions. The data were analyzed using the Shapiro–Wilk normality test, Levene's homogeneity test, and the Independent Samples t-test using IBM SPSS Statistics version 25.

The results showed that the mean posttest score of the experimental group was 87.67, whereas the control group obtained a mean score of 71.00. The Independent Samples t-test yielded a significance value (Sig. 2-tailed) of 0.000 (<0.05), indicating that the null hypothesis was rejected. Therefore, the use of Augmented Reality (AR) media based on Assemblr Edu significantly improved students' learning outcomes in Natural and Social Sciences (IPAS) on the topic of Cultural Diversity

Keyword: Augmented Reality, Assemblr Edu, Cultural Diversity, IPAS, Learning Outcomes.

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Introduction

Natural and Social Sciences (IPAS) learning at the elementary school level plays an important role in developing students' scientific literacy, social awareness, critical thinking skills, and understanding of the surrounding environment. One of the important learning topics in Grade IV is Cultural Diversity, which introduces students to the richness of Indonesian culture, including traditional houses, traditional clothing, and traditional musical instruments from various regions. Through this topic, students are expected not only to recognize cultural diversity but also to develop attitudes of tolerance, appreciation, and pride in Indonesia's cultural heritage. However, learning Cultural Diversity in elementary schools still faces several challenges. Based on preliminary observations conducted at SDN Mangkubumi, the learning process mainly relied on textbooks and static images. Such learning media were considered less effective because students found it difficult to visualize cultural objects that they had never seen directly. Consequently, many students were less interested in participating in classroom activities, and their understanding of the material remained low. The daily assessment results also showed that approximately 42% of students did not achieve.

the Minimum Mastery Criterion (KKM) of 75, indicating that students' learning outcomes were still unsatisfactory.

The use of appropriate instructional media is one of the determining factors in improving learning effectiveness. Interactive learning media can provide meaningful learning experiences by presenting abstract concepts in more concrete forms. According to Nuraini (2022), learning media that are less varied tend to reduce students' participation and motivation, especially in cultural learning that requires concrete visualization. Likewise, Afifah et al. (2022) explained that interactive learning media increase students' engagement, motivation, and learning achievement.

Recent developments in educational technology have encouraged teachers to integrate digital media into classroom instruction. One technology that has attracted considerable attention is Augmented Reality (AR). AR combines virtual three-dimensional objects with the real environment in real time, allowing students to interact directly with digital learning objects. This technology provides more meaningful and engaging learning experiences than conventional media because students can observe learning materials from different perspectives.

Among various AR platforms, Assemblr Edu is one of the educational applications that enables teachers to present three-dimensional learning objects interactively. Through Assemblr Edu, students can observe traditional houses, traditional clothing, and traditional musical instruments in 3D while accessing supporting information about each cultural object. Such interactive visualization is expected to facilitate students' conceptual understanding and increase their motivation during the learning process.

Previous studies have demonstrated the effectiveness of AR in education. Akçayır and Akçayır (2017) reported that AR enhances students' motivation, engagement, and conceptual understanding by providing realistic visualization of learning materials. Similarly, Garzón and Acevedo (2019) concluded through a meta-analysis that AR positively affects students' learning gains across different educational levels. Dewanto et al. (2024) also found that AR improves students' engagement and academic performance through immersive learning experiences.

Despite the increasing number of studies on AR, research specifically investigating the implementation of Assemblr Edu in Natural and Social Sciences (IPAS) learning on the topic of Cultural Diversity for elementary school students remains limited. Most previous studies focused on science education, mathematics, or higher education settings. Furthermore, only a few studies employed a quasi-experimental design to examine the effectiveness of AR in improving elementary students' learning outcomes on Indonesian cultural diversity. This limitation indicates the existence of a research gap that requires further investigation.

Therefore, this study aims to examine the effect of Augmented Reality (AR) media based on Assemblr Edu on the learning outcomes of fourth-grade students in Natural and Social Sciences (IPAS), particularly on the topic of Cultural Diversity at SDN Mangkubumi. The findings of this study are expected to provide empirical evidence regarding the effectiveness of AR-based learning media in improving elementary students' learning outcomes while contributing to the integration of educational technology into elementary education.

Method

This study employed a quantitative approach using a quasi-experimental method with a Nonequivalent Control Group Design. The study involved two groups: an experimental group receiving instruction using Augmented Reality (AR) media based on Assemblr Edu and a control group receiving conventional instruction. Both groups completed a pretest before the treatment and a posttest after the learning activities.

The research was conducted at SDN Mangkubumi, Tasikmalaya City, during the second semester of the 2025/2026 academic year. The population consisted of all fourth-grade students totaling 30 students. The sampling technique employed was saturated sampling (total sampling) because the entire population was used as the research sample. The experimental class consisted of 15 students, while the control class

also consisted of 15 students.

The independent variable in this study was the use of Augmented Reality (AR) media based on Assemblr Edu, whereas the dependent variable was students' learning outcomes in Natural and Social Sciences (IPAS) on the topic of Cultural Diversity.

Data were collected using a learning achievement test administered before (pretest) and after (posttest) the treatment. The test consisted of 20 multiple-choice questions that had been tested for validity and reliability before implementation. Documentation was also used to support the research process and record learning activities.

The experimental class received learning through Augmented Reality (AR) media using Assemblr Edu, enabling students to observe three-dimensional (3D) representations of Indonesian cultural diversity, including traditional houses, traditional clothing, and traditional musical instruments. Meanwhile, the control class received instruction using conventional teaching methods without AR media.

The collected data were analyzed using IBM SPSS Statistics version 25. The analysis included descriptive statistics, the Shapiro–Wilk normality test, Levene's homogeneity test, and the Independent Samples t-test. The hypothesis was tested at a significance level of 0.05. If the significance value (Sig. 2-tailed) was less than 0.05, the alternative hypothesis (H_1) was accepted, indicating a significant effect of Augmented Reality (AR) media based on Assemblr Edu on students' learning outcomes.

Results and discussions

This study aimed to examine the effect of Augmented Reality (AR) media based on Assemblr Edu on students' learning outcomes in Natural and Social Sciences (IPAS) on the topic of Cultural Diversity. Learning outcome data were obtained through pretests administered before the treatment and posttests administered after the learning process in both the experimental and control groups.

Table 3.
Descriptive Statistics of Pretest and Posttest Scores

Class	N	Pretest Mean	Posttest Mean
Experimental	15	42.33	87.67
Control	15	37.00	71.00

shows that the experimental group achieved a higher mean posttest score than the control group. The experimental group obtained a mean posttest score of 87.67, while the control group obtained 71.00. These findings indicate that students who learned using Augmented Reality (AR)

media based on Assemblr Edu demonstrated better learning outcomes than those who received conventional instruction.

Before testing the research hypothesis, prerequisite analyses consisting of the normality and homogeneity tests were conducted.

Table 4.
Results of the Normality Test

Class	Shapiro-Wilk sig.	Interpretio
Experimental	0.122	Normal
Control	0.126	Normal

The results of the Shapiro–Wilk normality test indicated that the significance values of both the

experimental and control groups were greater than 0.05. Therefore, the data were normally distributed and met the assumptions for parametric statistical analysis.

Table 5.

Results of the Homogeneity Test

Test	Sig.	Interpretation
Leven's Test	0.522	Homoginitas

The homogeneity test showed that the significance value was greater than **0.05**, indicating that the variances of the two groups were homogeneous. Therefore, the hypothesis testing could be continued using the Independent Samples t-test.

Table 6.

Results of the Independent Samples t-test

Variable	Sig.(2-tailed)	Decision
Learning Outcomes	0.000	H_0

The Independent Samples t-test produced a significance value (Sig. 2-tailed) of 0.000, which is lower than the significance level of 0.05. Therefore, the null hypothesis (H_0) was rejected and the alternative hypothesis (H_1) was accepted. These findings indicate that the use of Augmented Reality (AR) media based on Assemblr Edu had a significant effect on students' learning outcomes in Natural and Social Sciences (IPAS) on the topic of Cultural Diversity.

Discussion

The findings of this study demonstrate that the use of Augmented Reality (AR) media based on Assemblr Edu significantly improved students' learning outcomes in the topic of Cultural Diversity. This is evidenced by the higher mean posttest score achieved by the experimental group (87.67) compared with the control group (71.00). Furthermore, the Independent Samples t-test revealed a significance value of 0.000 (< 0.05), confirming that the implementation of AR-based learning media significantly influenced students' academic achievement.

The improvement in learning outcomes can be attributed to the ability of Assemblr Edu to present learning materials through interactive three-dimensional (3D) visualization. During the learning process, students explored various cultural objects, including traditional houses, traditional clothing, and traditional musical instruments, together with information about their names, regions of origin, and unique characteristics. This interactive visualization enabled students to observe cultural objects more concretely, making abstract concepts easier to understand. In addition, the implementation of Augmented Reality increased students' participation and engagement during classroom activities. Instead of passively listening to the teacher's explanation, students actively interacted with the learning media by observing 3D objects from different perspectives, reading the embedded information, and answering questions related to the displayed cultural objects. Such activities encouraged active learning and created a more enjoyable classroom atmosphere.

These findings support the theory that interactive learning media enhance students' conceptual understanding by providing meaningful learning experiences. The integration of virtual objects into real-world environments allows students to construct knowledge more effectively than through conventional learning methods.

The results are also consistent with previous studies reporting that Augmented Reality enhances students' motivation, engagement, and academic performance. The realistic visualization and interactive

features provided by AR help students understand learning materials more effectively while increasing their interest in classroom learning. Therefore, Assemblr Edu can be considered an effective instructional medium for teaching Cultural Diversity in elementary school Natural and Social Sciences (IPAS).

Overall, the findings indicate that the integration of Augmented Reality (AR) based on Assemblr Edu into classroom instruction provides a more engaging and meaningful learning experience than conventional teaching methods. Consequently, this technology has strong potential to be implemented as an innovative learning medium to improve students' learning outcomes, particularly in topics requiring concrete visualization such as Cultural Diversity.

Conclusion

This study concludes that the use of Augmented Reality (AR) media based on Assemblr Edu has a significant positive effect on students' learning outcomes in Natural and Social Sciences (IPAS) on the topic of Cultural Diversity among fourth-grade students at SDN Mangkubumi. Students who learned using AR-based media achieved higher learning outcomes than those who received conventional instruction, as indicated by the higher mean posttest score of the experimental group (87.67) compared to the control group (71.00). The hypothesis testing using the Independent Samples t-test also showed a significance value of 0.000 (< 0.05), indicating that the alternative hypothesis was accepted.

The interactive visualization provided by Assemblr Edu enabled students to observe three-dimensional representations of traditional houses, traditional clothing, and traditional musical instruments from different regions of Indonesia. This learning experience enhanced students' understanding of Cultural Diversity, increased their engagement during classroom activities, and created a more meaningful learning process. Therefore, Augmented Reality (AR) media based on Assemblr Edu can be recommended as an effective instructional medium for improving learning outcomes in elementary school Natural and Social Sciences (IPAS), particularly for learning materials that require concrete and interactive visualization.

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