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The Effect of Augmented Reality Based Assemblr Edu on Grade VII Students' Learning Outcomes in Islamic Education at SMP Muhammadiyah 5 Ngawi

Sabila Pangestuti[1], Nur Indah Sari[2]
[1,2] Universitas Darussalam Gontor

Corresponding Author: Sabila Pangestuti, Sabila, e-mail: sabilapangestuti1002@gmail.com

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ABSTRACT

Islamic Religious Education (PAI), particularly in Islamic history materials, requires learning media that can help students understand content that is narrative and abstract in nature. However, classroom instruction is still dominated by conventional media that are less engaging, causing students to be less active and experience difficulties in visualizing the material. This condition is reflected in students' learning mastery: in Class VII-A (control class), 75% of students (22 out of 29 students) achieved the Minimum Mastery Criteria (KKM). Meanwhile, in Class VII-B (experimental class), mastery reached only 64% (19 students), while 36% (10 students) had not yet achieved the KKM. Therefore, this study aims to determine the effect of using Augmented Reality based Assemblr Edu learning media on the learning outcomes of seventh-grade students in Islamic Religious Education (PAI) at SMP Muhammadiyah 5 Ngawi. This research employed a quantitative approach using a quasi-experimental method with a nonequivalent control group design. The population consisted of all seventh-grade students at SMP Muhammadiyah 5 Ngawi, totaling 58 students. The sampling technique used was saturated sampling, with Class VII-B as the experimental group and Class VII-A as the control group. The results showed that the pre-test scores between the control class (M = 63.45) and the experimental class (M = 57.93) were not significantly different, with Sig. = 0.057 (> 0.05), indicating that the students' initial abilities were comparable. After the treatment, the post-test results revealed a significant difference based on the Independent Samples t-test with Sig. (2-tailed) < 0.001 (< 0.05). The mean post-test score of the experimental class (M = 81.55) was higher than that of the control class (M = 68.28), indicating that Augmented Reality based Assemblr Edu learning media is more effective than conventional instruction in improving students' learning outcomes in Islamic Religious Education. Based on these findings, future research is expected to examine more diverse materials and involve a larger sample size to strengthen the research results.

Keywords: Augmented Reality, Assemblr Edu Media, Learning Outcomes, Islamic Education

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INTRODUCTION

In the 21st century, the rapid development of information technology has driven a shift in learning paradigms (Irjus Indrawan et al., 2019). Learning is no longer adequate if it relies solely on conventional media such as chalkboards; instead, it requires interactive and contextual media that align with students' technology-oriented daily lives. In line with these demands, both the 2013 Curriculum and the Merdeka Curriculum emphasize technology-based learning, the strengthening of 21st-century skills, and the implementation of student-centered learning (Annisa Tsamratul Fuadah et al., 2023).

Consequently, teachers are no longer positioned merely as transmitters of information, but as learning facilitators who are expected to manage diverse learning resources and utilize educational technology appropriately (Afriani et al., 2025). In the Islamic Education, technology integration must be implemented proportionally so that learning remains engaging while preserving the substance of religious values. Islamic Education learning does not only stress cognitive achievement but is also

oriented toward strengthening students' Islamic identity, historical awareness, and the internalization of moral values (Hariman Surya Siregar et al., 2025).

One Islamic Education topic that requires a more purposeful instructional strategy is the chapter "Damascus: The Center of Islamic Civilization in the East (661–750 AD)." At the Grade VII level, students begin to study important phases of early Islamic history and the dynamics of Islamic civilization (Amalia Syurgawi and Muhammad Yusuf, 2022). This chapter presents dense historical narrative about key figures and events, accompanied by descriptions of political, scientific, legal, social, and religious developments during the Umayyad period.

The narrative and complex nature of this material requires students to understand context, causal relationships among events, and representations of space and time. Moreover, the topic demands adequate visual support, such as historical settings and maps of the Umayyad territorial expansion. When learning relies only on text and static images, students may struggle to construct a coherent mental representation, which can limit their conceptual understanding (Ivana Deviyanti et al, 2025).

Such conditions may affect the quality of learning, including the emergence of monotonous instruction, a decline in learning motivation, and low student participation in classroom activities. Reduced motivation and engagement can ultimately influence students' learning outcomes. Therefore, meaningful and contextual Islamic history learning is necessary so that students can understand Islamic civilization more deeply and internalize noble values that are relevant to everyday life.

These conditions were also observed at Muhammadiyah 5 Ngawi Junior High School. Based on the results of an interview with Hafidz Ridho Abdulrahman an Islamic Education teacher at Muhammadiyah 5 Ngawi Junior High School, conducted on August 13, 2025, it was found that students experienced difficulties in understanding Islamic Cultural History material, particularly topics that require imagination and visualization. The teacher also reported that student engagement tended to be low; many students were passive, focused mainly on taking notes, and were less active in asking questions or exploring the material further. This indicates that the ongoing learning process had not fully fostered students' curiosity and deeper understanding.

These findings were reinforced by mastery-level data. In Class VII-A (the control class), 75% (22 out of 29 students) met the Minimum Mastery Criteria (KKM). Meanwhile, in Class VII-B (the experimental class), the mastery level reached only 64% (19 students), while 36% (10 students) had not yet met the KKM. This variation in I nitial achievement indicates the need for more innovative instructional support to help students understand the material more concretely and to improve learning outcomes.

As an alternative solution, this study proposes the use of Assemblr Education learning media based on Augmented Reality (AR). AR technology enables three-dimensional (3D) virtual objects to be integrated into the real world in real time, allowing students to observe and explore visual representations relevant to the lesson content. In learning the chapter "Damascus: The Center of Islamic Civilization in the East," AR has the potential to help students visualize the civilizational context and key elements of the Umayyad period, thereby making abstract concepts more concrete, contextual, and engaging. In addition, Assemblr Education is considered practical because it is user-friendly and provides a wide range of 3D assets.

Previous research conducted by Hanik discussed integrating augmented reality in islamic education: a case study of Al Ma'arif Singosari high school (Hanik Mahliatussikah et al., 2025). A similar study was carried out by Surani entitled the effect of using augmented reality media (assemblr edu) on enhancing junior high school students' learning interest (Surani & Fricticarani, 2023). Likewise, Farihana examined development of interactive islamic education teaching materials based on augmented reality using assemblr edu to improve students' learning outcomes in grade XI at SMAN 1 Grogol (Farihana, 2023).

Previous studies have emphasized the integration of Augmented Reality (AR) in Islamic Education learning in general and have primarily focused on improving students' learning interest as an affective variable. Although the development and implementation of AR have been widely applied, research on its application in Islamic Education particularly in complex historical topics such as the Umayyad Dynasty in Damascus remains relatively limited. Therefore, this study aims to examine the

significant effect of using Augmented Reality based Assemblr EDU media on the Islamic Education learning outcomes of Grade VII students at Muhammadiyah 5 Ngawi Junior High School.

METHOD

This research uses a quantitative approach, which emphasizes the processing of numerical data and statistical analysis to objectively determine the influence between variables (Sugiyono, 2019). This study employed a quasi-experimental design. The specific design emplayed use is the Non-Equivalent Control Group Design. This design involves a pre-test to measure the students' initial ability before treatment and a posttest to measure the results after treatment (Mallory Nicole Ball, 2021). The research design can be illustrated as follows:

Table 1. Research Design

Group	Pre-test	Treatment	Posttest
Experimental Group	O_1	X	O_2
Control Group	O_3	-	O_4

Based on this design, both two groups were given a pre-test to determine their initial level. Furthermore, the experimental class receives learning using Augmented Reality based Assemnlr EDU, while the control class learns conventionally. After the learning process is completed, both groups are given a posttest to measure their learning outcomes. The comparison of the pre-test and posttest results between the two groups will be the basis for determining the impact of using Assemblr AR on students' learning outcomes.

The population in this study included all seventh grade students at Muhammadiyah 5 Ngawi Junior High School in the academic year 2025/2026. The sample consisted of 58 Grade VII students divided into two intact classes. Class VII-B (29 students) was assigned as the experimental group, while Class VII-A (29 students) served as the control group.

FINDING AND DISCUSSION

1. Descriptive Statistical Analysis

a. Student Learning Outcomes

In this study, students' learning outcomes were analyzed based on the post-test scores of two groups: the experimental group, which learned using Augmented Reality based Assemblr Edu learning media, and the control group, which received conventional instruction without the use of the media. Descriptive statistics were used to provide an overall picture of students' learning outcomes after the treatment. The statistics included the minimum score, maximum score, mean, and standard deviation. All analyses were conducted using SPSS version 25. Below are the data presented in this study:

Table 2. Descriptive Statistics Post Test

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
eksperimen	29	65	100	81.55	10.615
kontrol	29	55	80	68.28	7.473
Valid N (listwise)	29				

Based on the post-test results presented in Table Descriptive Statistcs, this section describes students' performance in the experimental class, which received instruction using Augmented Reality based Assemnlr EDU media, and in the control class, which received conventional instruction without the media. The experimental class that received instruction using Augmented Reality based Assemnlr EDU media obtained scores ranging from 65 to 100, with a mean of 81.55 and a standard deviation of 10.615. These findings indicate that, in general, students' learning outcomes in the experimental class were relatively high, although there was variation in scores among students.

Based on Table 21, the experimental group obtained post-test scores ranging from 65 to 100, with a mean score of 81.55 and a standard deviation of 10.615. This indicates that students in the experimental group achieved generally higher learning outcomes, although there was some variation among students' scores. Meanwhile, the control group obtained post-test scores ranging from 55 to 80, with a mean score of 68.28 and a standard deviation of 7.473. These results show that the average learning outcomes in the control group were lower than those in the experimental group, with a relatively smaller spread of scores.

b. Prerequisite Test of Analysis

Before testing the hypothesis regarding the effect of Augmented Reality (AR) learning media on students' learning outcomes, prerequisite tests were first conducted. These tests were intended to ensure that the data met the fundamental assumptions required for parametric statistical analysis. The two prerequisite tests applied in this study were the normality test and the homogeneity of variance test.

Normality test

The normality test was conducted to determine whether the post-test score data were normally distributed. Normality testing can be performed using the Kolmogorov–Smirnov or Shapiro–Wilk test. The normality test on Post-Test Scores are presented in the following table:

Table 3. Results of Normality Tests

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	kelas	Statistic	df	Sig.	Statistic	df	Sig.
postest kelas kontrol eksperimen	1	.152	29	.084	.936	29	.078
	2	.145	29	.121	.937	29	.085

a. Lilliefors Significance Correction

The normality test results for the post-test scores are presented in the following table. Since each group consisted of 29 students ($n < 50$), the Shapiro–Wilk test was used as the primary reference. The Shapiro–Wilk significance values were 0.078 for the control class and 0.085 for the experimental class. As both values are greater than 0.05, the post-test scores in both groups were normally distributed. This conclusion was also supported by the Kolmogorov–Smirnov test (Sig. = 0.084 for the control class and Sig. = 0.121 for the experimental class). Therefore, hypothesis testing could proceed using a parametric statistical test.

Homogeneity Test

In this study, homogeneity was tested using Levene's Test for Equality of Variances in SPSS version 25. This test was used as an assumption check prior to conducting the Independent Samples t-test (Nourhasanah, 2022).

Table 4. Results of Levene's Test for Homogeneity

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
postest kelas kontrol eksperimen	Based on Mean	3.537	1	56	.065
	Based on Median	2.417	1	56	.126
	Based on Median and with adjusted df	2.417	1	49.297	.126
	Based on trimmed mean	3.467	1	56	.068

Based on Levene's Test on the post-test scores, the significance value (Sig.) based on the mean was 0.065. Since this value is greater than 0.05, the variances of the experimental and control groups can be considered homogeneous. Therefore, hypothesis testing could proceed using the Independent Samples t-test under the equal variances assumed condition.

c. Hypothesis Testing

Referring to the prerequisite test results, both the normality and homogeneity tests indicated that the post-test data were normally distributed and had homogeneous variances. Therefore, hypothesis testing was conducted using the Independent Samples t-test.

Table 5. Results of Independent Samples t-Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
postest kelas kontrol eksperimen	Equal variances assumed	3.537	.065	-5.507	56	.000	-13.276	2.411	-18.105	-8.447
	Equal variances not assumed			-5.507	50.282	.000	-13.276	2.411	-18.117	-8.434

Based on the Independent Samples t-test results for the post-test scores, the Sig. (2-tailed) value was < 0.001 in the Equal variances assumed row. Since this value is lower than the significance level of 0.05, H_0 was rejected and H_a was accepted. This indicates that there was a statistically significant difference in learning outcomes between the experimental class and the control class. Furthermore, the experimental class achieved a higher mean post-test score (M = 81.55) compared to the control class (M = 68.28), indicating that students who learned using AR-based Assemblr Edu learning media obtained better learning outcomes than those who received conventional instruction.

DISCUSSION

The findings of this study show a significant difference in Islamic Education learning outcomes between students taught using Augmented Reality based Assemnlr EDU media and those taught using conventional instruction. The experimental group achieved a higher mean post-test score (81.55) than the control group (68.28), indicating that the use of AR-based learning media positively influenced students' learning outcomes in Islamic Education.

This improvement occurred because Augmented Reality based Assemnlr EDU media presents learning material in a more concrete, visual, and contextual form. Islamic Education materials, particularly Islamic history, require students to understand abstract concepts, chronological sequences, and spatial contexts. Conventional learning that relies mainly on text and static images often makes it difficult for students to construct a clear mental representation of historical events. AR technology helps overcome this limitation by visualizing learning content in three-dimensional forms that can be directly observed and explored by students.

From a theoretical perspective, this finding is in line with Dual Coding Theory by Paivio, which states that learning is more effective when information is presented through both verbal and visual channels (Paivio, 1986). Augmented Reality based Assemnlr EDU media integrates textual explanations with visual representations, enabling students to process information more effectively and improve memory retention. Three-dimensional representations of locations, characters, and geographical surroundings complement textual accounts of Islamic historical events. This dual representation reduces the possibility of fragmented understanding, which frequently happens when students only rely on textual narratives, and enhances associative links in memory. It also makes encoding and retrieval processes easier. In addition, the Cognitive Theory of Multimedia Learning by Mayer explains that meaningful learning occurs when students actively integrate words and images (Mayer, 2009). Through AR interaction, students engage more deeply with the material compared to passive learning in conventional classrooms.

This argument is further strengthened by Ratih's study, which emphasizes that the use of Augmented Reality based Assemblr EDU media aligns with constructivist learning principles, as it positions students as active knowledge constructors rather than passive recipients of information (Ratih et al., 2025). Students participate in methods of investigation, observation, and interpretation that promote a richer conceptual understanding through hands-on engagement with three-dimensional objects. As students make connections between previously learned material and newly

obtained information in a real-world visual environment, this dynamic engagement not only boosts participation but also fosters meaningful learning.

Furthermore, by arranging intricate historical material into structured visual representations, AR-based media support more efficient cognitive processing from the standpoint of Cognitive Load Theory (John Sweller, Paul Ayres, 2011). Students can devote more cognitive resources to schema development and conceptual integration by using AR, which minimizes unnecessary cognitive load and maximizes germane cognitive load by concurrently integrating spatial, textual, and contextual information. Students are able to digest material more methodically and effectively as a result, which eventually improves learning outcomes and increases the recall of historical topics.

By exploring AR objects, students become more engaged and involved in the learning process, which enhances understanding and reduces misconceptions. This active learning process contributed to better learning outcomes in the experimental class. Despite these positive findings, several limitations should be acknowledged. This study was conducted in a single school with a relatively small sample size, which may limit the generalizability of the results to broader educational contexts. In addition, the duration of the treatment was limited to one instructional unit, so the long-term effects of AR-based learning media on students' retention and deeper conceptual understanding were not examined.

CONCLUSIONS

Based on the Independent Samples t-test conducted on the post-test data, the Sig. (2-tailed) value was $p < 0.001$ in the Equal variances assumed row. Since this value is lower than 0.05, H_0 was rejected and H_a was accepted, indicating a statistically significant difference in learning outcomes between the experimental class and the control class. The magnitude of this difference is evident in the mean post-test scores, with the experimental group attaining an average score of 81.55, compared to 68.28 in the control group. These results indicate that the use of Augmented Reality based Assemnlr EDU media leads to superior learning outcomes relative to conventional instructional methods.

From a practical perspective, AR-based Assemblr Edu learning media can be used as an alternative learning medium in Islamic Education, especially for historical topics that require visualization. However, teachers need to prepare well-planned learning scenarios, including clear instructions, supporting worksheets, and appropriate time allocation, so that AR activities remain focused on learning objectives. This study was limited to two classes in one school and was conducted within a specific treatment period; therefore, future research is recommended to involve larger samples, longer treatment duration, different Islamic Education topics, and additional variables such as motivation, learning interest, or students' attitudes toward AR-based learning.

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