

AI-Assisted Learning for Qur'anic Reading Skills

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Abstract: The purpose of this study is to analyze the effect of Artificial Intelligence (AI)-supported learning on students' Qur'anic reading skills. The background of this study is based on the rapid development of AI technology in education, which has the potential to improve the effectiveness and quality of learning, while its implementation in Islamic education is still limited and requires empirical evidence. This study used an experimental method with a pre-test and post-test control group design. The research sample consisted of 60 students divided into two groups: 30 students in the experimental group using AI-assisted learning and 30 students in the control group using conventional methods. The research instrument was a test of Qur'anic reading skills that had been tested for validity and reliability. Data analysis was carried out using a t-test to determine differences in learning outcomes between the two groups. The results showed a significant improvement in the experimental group compared to the control group, with an average post-test score of 85.4 for the experimental group and 74.2 for the control group, with a significance value ($p < 0.05$). These findings indicate that AI-assisted learning is effective in improving students' Qur'anic reading skills through increased interactivity and personalized learning. However, this study is limited by its relatively short implementation time and limited access to technological devices. Therefore, further research is recommended to examine the long-term implementation and integration of AI in Qur'anic learning more broadly and in depth.

Keywords: AI-assisted learning; Qur'anic reading; educational technology; artificial intelligence.

1. Introduction

The development of digital technology in the era of the Industrial Revolution 4.0 to Society 5.0 has brought very significant changes in various aspects of human life, including in the field of education (Ellitan, 2020; Ziatdinov et al., 2024). This transformation has not only changed the way people access information, but also influenced the learning paradigm from previously conventional to more modern, flexible, and technology-based (Sukisno et al., 2025). In this context, technology no longer functions only as a learning aid, but has evolved into an integral part of the education system, capable of creating a more effective, efficient, and meaningful learning experience (Mhlanga, 2022). One technological innovation that is currently developing rapidly is Artificial Intelligence (AI), which has the ability to process large amounts of data, provide real-time feedback, and adapt learning materials according to the needs and characteristics of students (de Laat et al., 2020; Wang et al., 2020; Paramesha et al., 2024). The presence of AI in the world of education opens new opportunities in creating learning that is more adaptive, interactive, and oriented towards improving the quality of learning outcomes (Dhanasekaran, 2025; Strielkowski et al., 2025).

In modern educational practice, the use of AI has demonstrated various advantages, such as its ability to provide adaptive learning systems, analyse learning performance, and personalize materials tailored to students' levels of understanding ([Sari et al., 2024](#)). This makes AI an innovative solution to address various learning challenges, such as low student engagement, learning ability gaps, and the limitations of conventional, one-way learning methods. However, the implementation of AI technology in Islamic education remains relatively limited and has not been fully integrated systematically ([Almusaed et al., 2023](#)). Yet, Islamic education plays a crucial role in shaping students' character, morals, and spirituality, requiring a learning approach that is not only cognitively effective but also able to address affective and spiritual aspects ([Irpan & Sain, 2024](#)). Therefore, the integration of AI in Islamic education is an urgent need to address the challenges of the times and improve the quality of learning.

Islamic education essentially aims to shape individuals with faith, knowledge, and noble character through a deep understanding of Islamic teachings. However, in reality, the Islamic learning process still faces various challenges, particularly in conveying abstract material, such as the concepts of monotheism, worship, and morality ([Komariah & Nihayah, 2023](#)). Learning methods that are still dominated by lectures and memorization often result in students lacking a deep understanding of concepts and tend to be textual. This situation indicates a gap between the ideal goals of Islamic education and learning practices in the field ([Chew & Cerbin, 2021](#); [Fitrianto, 2024](#)). Therefore, learning innovations are needed to address these issues, one of which is through the use of AI technology, which can provide more contextual, visual, and interactive learning. Thus, students not only understand the material theoretically but are also able to internalize Islamic values in their daily lives ([Guan et al., 2020](#); [Tan, 2023](#)).

Several previous studies have illustrated the potential of utilizing technology, particularly AI, to improve the quality of learning. The first study demonstrated that the application of AI in adaptive learning can significantly improve student learning outcomes through the presentation of material tailored to individual needs ([Gligorea et al., 2023](#)). The second study found that the use of AI-based systems can increase student engagement and motivation due to more dynamic interactions and fast and accurate feedback ([Yildiz Durak & Onan, 2025](#)). The third study revealed that the integration of digital technology in Islamic education has a positive impact on student learning interest, although it did not specifically measure Qur'anic reading skills in depth ([Azman et al., 2025](#)). The fourth study stated that technology-based learning can improve students' critical thinking and analytical skills, especially in understanding abstract and complex material ([Widiyaningsih et al., 2025](#)). Meanwhile, the fifth study showed that the use of AI in concept-based learning can help students understand material more comprehensively through visualizations, simulations, and interactive approaches that support knowledge construction ([Kong et al., 2022](#)).

Based on these various studies, it can be concluded that AI technology has enormous potential to improve learning effectiveness, both in terms of learning outcomes, motivation, and reading proficiency. However, most research still focuses on general education and has not specifically examined the application of AI in Islamic learning, particularly as it relates to improving Qur'anic reading skills. Furthermore, the research approach used is still dominated by descriptive studies, and not many have used experimental methods to directly test the effectiveness of AI-assisted learning. This indicates a research gap that needs to be filled

through more in-depth and measurable empirical studies.

Thus, the state of the art in this research lies in the integration of AI technology and Qur'anic learning through a systematic and measurable experimental approach. This research not only adopts technology as a learning tool but also seeks to develop a learning model capable of enhancing students' Qur'anic reading skills through an interactive and adaptive approach. The main objective of this research is to empirically test the effect of AI-assisted learning on improving students' Qur'anic reading skills. It is hoped that this will make a real contribution to the development of innovative Islamic education learning that is relevant to technological developments in the digital era. Furthermore, this research is also expected to serve as a basis for the development of more modern educational policies and practices, without neglecting the fundamental values of Islamic teachings.

2. Methodology

This study uses a quantitative approach with an experimental method ([Gopalan et al., 2020](#); [Hamilton et al., 2021](#)), aimed at empirically testing the effect of Artificial Intelligence (AI)-assisted learning on students' Qur'anic reading skills. The experimental design used is a pre-test and post-test control group design, which allows comparison of initial and final abilities between the experimental and control groups, so that cause-and-effect relationships can be identified more accurately ([Rahman et al., 2024](#)). The population in this study consisted of secondary school students taking Islamic Religious Education courses. The research sample consisted of 60 students selected using a simple random sampling technique. The samples were then divided into two groups, namely 30 students as the experimental group who received AI-assisted learning and 30 students as the control group who received conventional learning. The research design used can be seen in Table 1 below:

Table 1. Pre-test Post-test Control Group Research Design

Group	Pre-test	Treatment	Post-test
Experiment (n=30)	O1	X (AI-assisted learning)	O2
Control (n=30)	O3	- (Conventional learning)	O4

The variables in this study consist of independent and dependent variables ([Akram et al., 2020](#); [Rahman et al., 2025](#)). The independent variable is AI-assisted learning, while the dependent variable is students' Qur'anic reading skills. The implementation of AI-assisted learning was carried out through a digital platform featuring adaptive learning, automated pronunciation assessment, real-time feedback, tajwid guidance, and interactive recitation exercises. Meanwhile, the control group used lecture, demonstration, and guided reading methods without the aid of AI technology.

The research instrument used was a Qur'anic reading skills test consisting of oral performance assessments and written tests. The assessment was structured based on indicators of Qur'anic reading proficiency, namely accuracy of pronunciation (makhrāj), application of tajwid rules,

reading fluency, and recitation accuracy. The instrument underwent validity testing by experts and reliability testing using a high Cronbach's Alpha coefficient. The instrument outline is presented in Table 2 below:

Table 2. Grid of Instruments for Qur'anic Reading Skills

No	Qur'anic Indicators	Reading	Question Form	Number of Items
1	Pronunciation (makhraj)	accuracy	Oral test	5
2	Application of tajwid rules		Oral test	10
3	Reading fluency		Oral test	5
4	Recitation accuracy		Oral test	5
Total				25

The research procedure was carried out systematically, encompassing preparation, implementation, and analysis ([Marzi et al., 2025](#)). The preparation phase included instrument development and validation. The implementation phase included pre-tests, treatment, and post-tests. The experimental group received AI-assisted learning during four meetings of 90 minutes each, while the control group received conventional learning with the same material. Details of the research procedures are presented in Table 3 below:

Table 3. Research Procedures

Stage	Activity
Preparation	Instrument development, validity and reliability testing
Pre-test	Measuring students' initial Qur'anic reading skills
Treatment	AI-assisted (experimental) and conventional (control) learning
Post-test	Measuring final Qur'anic reading skills
Data analysis	Data processing and interpretation

The data analysis technique used inferential statistics ([Stapor, 2020](#)). Before hypothesis testing, prerequisite tests in the form of normality and homogeneity tests were conducted to ensure that the data were normally distributed and had homogeneous variance. Next, an independent sample t-test was performed to determine differences in learning outcomes between the experimental and control groups, while a paired sample t-test was used to determine improvement within each group. In addition, N-Gain analysis was employed to measure the level of improvement in students' Qur'anic reading skills. The hypothesis testing criterion was set at a significance level of $\alpha = 0.05$. Details of the data analysis techniques can be seen in Table 4 below:

Table 4. Data Analysis Techniques

Test Type	Objective

Normality Test	Determining data distribution
Homogeneity Test	Determining variance similarity
Paired Sample t-test	Measuring improvement within groups
Independent Sample t-test	Testing differences between groups
N-Gain	Determining the level of improvement in Qur'anic reading skills

With a systematic method design, the use of valid and reliable instruments, and appropriate analysis techniques, this research is expected to produce accurate and scientifically accountable findings in measuring the effectiveness of AI-assisted learning on students' Qur'anic reading skills.

3. Result and discussion

3.1 Descriptive Statistics

Descriptive statistical analysis was conducted to provide an overview of the distribution of pre-test and post-test data in the experimental and control groups. The results of data processing using SPSS are presented in the following table:

Table 5. Group Statistics of Qur'anic Reading Skills

Group	N	Mean	Std. Deviation	Std. Error Mean	Minimum	Maximum
Experiment Pre-test	30	62.30	6.412	1.171	50	75
Pre-test Control	30	61.80	6.785	1.238	49	74
Experiment Post-test	30	85.40	5.983	1.092	74	95
Post-test Control	30	74.20	7.104	1.297	60	88

Based on Table 5, it can be seen that the average pre-test scores of the experimental group (62.30) and the control group (61.80) did not show a significant difference, indicating that the initial Qur'anic reading skills of the two groups were relatively equal. This is important in experimental research to ensure that differences in final results are truly caused by the treatment given. After the treatment, the average post-test score of the experimental group increased significantly to 85.40, while the control group only reached 74.20. Furthermore, the relatively small standard deviation values indicate that the data are quite homogeneous and do not exhibit extreme deviations. The range of minimum and maximum values also indicates that the experimental group experienced a more consistent improvement in Qur'anic reading performance compared to the control group.

3.2 Normality Test

Normality tests are carried out to ensure that the data is normally distributed as one of the requirements for using parametric statistics.

Tabel 6. Tests of Normality

Group	Kolmogorov-Smirnov Statistics	df	Say.	Shapiro-Wilk Statistic	df	Say.
Experiment Pre-test	0.121	30	0.200	0.962	30	0.354
Pre-test Control	0.118	30	0.200	0.958	30	0.287
Experiment Post-test	0.109	30	0.176	0.971	30	0.522
Post-test Control	0.115	30	0.165	0.966	30	0.401

Based on Table 6, the significance values for both the Kolmogorov-Smirnov and Shapiro-Wilk tests were all greater than 0.05. This indicates that the pre-test and post-test data for both groups were normally distributed. Therefore, the assumption of normality was fulfilled, allowing further analysis using parametric statistical tests such as the t-test.

3.3 Homogeneity Test

The homogeneity test aims to determine whether the variance between the experimental and control groups is the same.

Tabel 7. Test of Homogeneity of Variances

Data	Levene Statistic	df1	df2	Say.
Pre-test	0.657	1	58	0.421
Post-test	0.928	1	58	0.337

The results in Table 7 show that the significance values for the pre-test (0.421) and post-test (0.337) were greater than 0.05. This indicates that the variances of both groups were homogeneous. Therefore, the homogeneity assumption was met, and hypothesis testing using the independent sample t-test could be conducted.

3.4 Uji Paired Sample t-test

This test was conducted to determine whether there was a significant increase in each group.

Tabel 8. Paired Samples Statistics

Group	Mean Pre-test	Mean Post-test	N	Std. Deviation
Experiment	62.30	85.40	30	6.412
Control	61.80	74.20	30	6.785

Tabel 9. Paired Samples Test

Group	Mean Difference	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
Experiment	23.10	5.872	1.072	21.457	29	0.000
Control	12.40	6.103	1.114	11.326	29	0.000

Based on the results of the paired sample t-test in Table 9, a significance value of 0.000 ($p < 0.05$) was obtained for both groups. This indicates a significant increase between the pre-test and post-test scores in both the experimental and control groups. However, the mean difference value for the experimental group (23.10) was considerably higher than that of the control group (12.40), indicating that AI-assisted learning had a greater impact on improving students' Qur'anic reading skills. The findings suggest that AI-based learning environments, which provide immediate feedback, pronunciation correction, and personalized exercises, effectively support students in improving reading fluency, tajwid application, and pronunciation accuracy.

3.5 Uji Independent Sample t-test

This test was conducted to determine the differences in learning outcomes between the experimental group and the control group after treatment.

Tabel 10. Independent Samples Test

Variable	Mean Difference	t	df	Sig. (2-tailed)	95% CI Lower	95% CI Upper
Post-test Qur'anic Reading Skills	11.20	6.584	58	0.000	7.80	14.60

Based on Table 10, a significance value of 0.000 ($p < 0.05$) was obtained, indicating a significant difference between the post-test results of the experimental and control groups. The mean difference of 11.20 indicates that the experimental group demonstrated significantly better Qur'anic reading skills than the control group. The confidence interval that did not cross zero further confirmed that the difference was statistically significant. These findings indicate that AI-assisted learning is more effective than conventional methods in enhancing students' Qur'anic reading performance.

3.6 N-Gain Analysis

N-Gain analysis is conducted to measure the effectiveness of improving learning outcomes.

Table 11. N-Gain Results of Qur'anic Reading Skills

Group	Mean Pre-test	Mean Post-test	N-Gain	Category
Experiment	62.30	85.40	0.68	Medium–High
Control	61.80	74.20	0.32	Currently

The results in Table 11 show that the experimental group's N-Gain value was 0.68, which falls within the medium-to-high category, while the control group only achieved 0.32, which falls within the medium category. This indicates that AI-assisted learning is more effective in improving students' Qur'anic reading skills than conventional learning methods. The higher N-Gain score in the experimental group suggests that AI technology can facilitate more adaptive and interactive learning experiences, enabling students to receive individualized feedback and repeated practice according to their learning needs. Overall, the findings of this study demonstrate that AI-assisted learning significantly improves students' Qur'anic reading skills, particularly in aspects of pronunciation accuracy (*makhraj*), application of tajwid rules, reading fluency, and recitation accuracy. These results support previous studies highlighting the potential of AI to enhance personalized and interactive learning environments. Therefore, integrating AI into Qur'anic learning may serve as an innovative strategy to improve the quality of Islamic education in the digital era.

Discussion

The results of this study indicate that Artificial Intelligence (AI)-assisted learning significantly improves students' Qur'anic reading skills, as demonstrated by comprehensive statistical analyses, including descriptive statistics, prerequisite tests, and hypothesis testing. The significantly higher post-test scores of the experimental group compared to the control group indicate that the integration of AI into learning enhances the effectiveness of Qur'anic instruction. These findings are consistent with the objective of this study, which was to empirically examine the effect of AI-assisted learning on improving students' Qur'anic reading skills.

More specifically, the substantial improvement in the experimental group suggests that AI functions not merely as a technological tool but also as an effective learning facilitator capable of creating interactive, adaptive, and personalized learning experiences. Through AI-assisted learning, students receive immediate feedback on pronunciation errors, tajwid application, and reading fluency. AI systems can also provide repetitive exercises tailored to students' individual learning needs, enabling them to improve their recitation skills more effectively ([Yildiz Durak & Onan, 2025](#); [Abdalla, 2025](#)). Consequently, students become more proficient in applying tajwid rules and articulating Arabic letters correctly according to their *makhraj*.

From a pedagogical perspective, the findings confirm that effective learning should accommodate individual differences among learners. AI enables personalized learning by

adapting instructional materials and exercises according to students' reading abilities and learning pace ([El-Sabagh, 2021](#)). Such individualized instruction is difficult to achieve in conventional classrooms, where teaching tends to be teacher-centered and uniform. As a result, students in the experimental group demonstrated more consistent and significant improvement than those in the control group. Moreover, the real-time feedback feature allowed students to identify and correct their mistakes immediately, thereby enhancing learning efficiency and reducing repeated errors in Qur'anic recitation.

The findings of this study are also in line with constructivist learning theory, which emphasizes that knowledge and skills are actively constructed through interaction with the learning environment ([Efgivia et al., 2021](#)). In this context, AI serves as an interactive digital learning environment that encourages students to practice actively, receive feedback, and gradually refine their recitation abilities. Learning to read the Qur'an is not merely a process of memorization but also requires mastery of pronunciation, tajwid rules, and fluency. Therefore, AI-assisted learning provides meaningful opportunities for students to develop these competencies through continuous practice and interaction.

Furthermore, the N-Gain analysis showed that the experimental group achieved an N-Gain score of 0.68, categorized as medium-to-high, whereas the control group obtained a score of only 0.32, categorized as medium. These findings confirm that AI-assisted learning is more effective than conventional methods in improving students' Qur'anic reading skills. The improvement was reflected in students' pronunciation accuracy, fluency, and overall recitation performance. In addition, AI-based learning environments increase student engagement and motivation through interactive and adaptive learning experiences ([Xu et al., 2023](#)).

The findings of this study support previous research suggesting that digital technologies, particularly AI, can improve learning outcomes and skill acquisition ([Weng et al., 2024](#); [Wu, 2024](#); [Zhang & Zhang, 2024](#)). However, this study provides a more specific contribution by examining the effectiveness of AI in the context of Qur'anic learning through a measurable experimental approach. Thus, this research not only confirms previous findings but also offers new empirical evidence regarding the potential of AI to enhance Islamic education, particularly in improving students' Qur'anic reading skills.

Despite the positive findings, several limitations should be acknowledged. The relatively short duration of treatment may have influenced the extent of students' improvement. Additionally, limited access to technological devices and teachers' readiness to integrate AI into learning remain challenges in implementing AI-assisted Qur'anic instruction. Therefore, adequate infrastructure and teacher training are necessary to ensure the effective and sustainable use of AI in Islamic education. Overall, the findings of this study confirm that AI-assisted learning is an effective innovation for improving students' Qur'anic reading skills. AI not only enhances learning outcomes quantitatively but also improves the quality of recitation through interactive, adaptive, and personalized learning experiences. Therefore, integrating AI into Qur'anic education has considerable potential to become an innovative solution for Islamic learning in the digital era while preserving the fundamental values of Islamic teachings.

3. Conclusion

This study concludes that Artificial Intelligence (AI)-assisted learning has a significant and positive effect on improving students' Qur'anic reading skills. The findings showed that the experimental group achieved significantly higher post-test scores and N-Gain values than the control group, indicating that AI-assisted learning is more effective than conventional learning methods. Through features such as real-time feedback, pronunciation correction, tajwid guidance, and personalized exercises, AI helps students improve pronunciation accuracy (makhraj), application of tajwid rules, reading fluency, and overall recitation accuracy. Furthermore, AI-assisted learning promotes active engagement and independent learning by enabling students to practice repeatedly according to their individual needs and learning pace. These findings highlight the importance of integrating AI into Qur'anic education as an innovative strategy to improve learning quality in the digital era while preserving Islamic values. However, challenges remain regarding technological infrastructure and teachers' readiness to integrate AI into classroom instruction. Therefore, adequate infrastructure and teacher training are necessary to ensure the sustainable implementation of AI-assisted learning. Future research is recommended to investigate the long-term effects of AI-assisted learning and explore its broader integration into Islamic education.

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Author contribution

Ikhwan Rahman: Conceptualization, writing-reviewing, investigation, observations, editing. **Wira Wati:** Data curation, supervision, providing feedback, validation, correction.

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Cometing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this research.

AI Statement

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authors, who take full responsibility for the content of this article.

Ethical clearance

This study was conducted with the permission and approval of the participating institution. All participants were informed about the purpose of the study, and the institution consented to the use and publication of the research findings for academic purposes.

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