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Integrating Gemini AI into Islamic Moral Education: Implications for Students' Learning Outcomes

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ABSTRACT

This study aimed to examine the effectiveness of Gemini AI-assisted learning in improving students' understanding of Akidah Akhlak, particularly regarding social media ethics. A quantitative approach was employed using a pre-experimental one-group pretest–posttest design. The participants consisted of 28 eighth-grade students selected through total sampling. Data were collected using an essay test instrument that met validity and reliability requirements, with a Cronbach's Alpha coefficient of 0.745. Data analysis included the Shapiro–Wilk normality test, homogeneity test, paired-sample t-test, and effect size calculation. The findings indicated that the data met the assumptions of normality and homogeneity. The paired-sample t-test revealed a significant difference between pretest and posttest scores ($p < 0.05$), demonstrating a substantial improvement in students' understanding after the implementation of Gemini AI-assisted learning. Furthermore, the effect size analysis produced a Cohen's d value of 7.336, indicating a very large effect. These findings suggest that Gemini AI-assisted learning is highly effective in enhancing students' understanding of social media ethics in Akidah Akhlak and highlight the potential of AI-based technologies as innovative pedagogical tools that can support more interactive, adaptive, and meaningful learning experiences in the digital era.

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INTRODUCTION

The rapid advancement of Artificial Intelligence (AI) has significantly transformed various sectors of society, including education (Azizah & Chalimatusadiah, 2025; Sari et al., 2024). As digital technologies continue to reshape learning environments, educational institutions are increasingly encouraged to adopt innovative approaches that support students' cognitive development and engagement (Dankel & Loenneke, 2021). AI technologies

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enable learners to access information more efficiently, receive personalized feedback, and engage in adaptive learning experiences tailored to their individual needs (Bai & Wang, 2025; Cai et al., 2024). This transformation is particularly important in the twenty-first century, where digital literacy, critical thinking, and problem-solving skills have become essential competencies for students. Recent studies indicate that AI-based educational tools contribute positively to learner engagement and academic achievement by facilitating interactive and student-centered learning experiences (Imran & Almusharraf, 2024). Consequently, integrating AI into educational practice is no longer merely a technological trend but a strategic necessity for preparing students to navigate increasingly complex social and digital environments. Therefore, investigating the effectiveness of AI-supported learning is important because it may provide evidence-based solutions for improving educational quality and promoting meaningful learning outcomes in contemporary society.

Among the emerging AI technologies, Gemini AI, developed by Google DeepMind, has attracted considerable attention due to its multimodal capabilities. Gemini AI can process and integrate text, images, audio, and video simultaneously, enabling richer and more interactive learning experiences than conventional digital tools (Parker, 2024). The theoretical foundation of this study is informed by constructivist learning theory, which emphasizes that knowledge is actively constructed through interaction, exploration, and reflection. From a constructivist perspective, AI-assisted learning environments can facilitate meaningful learning by allowing students to explore information independently and receive immediate feedback. In addition, the Cognitive Theory of Multimedia Learning suggests that learners understand concepts more effectively when information is presented through multiple modes of representation (An et al., 2025; Chan & Hu, 2023). Gemini AI's multimodal features align with this theory by enabling the integration of textual and visual information in ways that support deeper understanding. Imran and Almusharraf (2024) argue that the adaptive and personalized features of Gemini AI provide substantial opportunities for enhancing learning effectiveness, particularly in digital learning environments that require active learner participation and contextual engagement.

Despite the growing availability of educational technologies, significant challenges remain in Islamic education, particularly in the teaching of Akidah Akhlak. This subject is designed not only to develop students' understanding of Islamic beliefs but also to foster moral reasoning, character development, and the application of ethical values in everyday life (Krisnajaya et al., 2024). However, learning practices in many educational settings continue to rely heavily on teacher-centered instruction, where students are often positioned as passive

recipients of information. Such approaches frequently emphasize memorization rather than conceptual understanding and critical reflection (Fauzia et al., 2025). As a result, students often struggle to connect religious concepts with real-life situations, especially contemporary issues emerging from digital interactions, such as cyberbullying, hate speech, misinformation, and unethical social media behavior (Bahri & Najiburrahman, 2024). Furthermore, limited opportunities for discussion and inquiry-based learning may hinder students' ability to internalize moral values and develop higher-order thinking skills. These conditions highlight the need for innovative instructional approaches capable of promoting active engagement, contextual understanding, and meaningful moral learning (Ahmed et al., 2024; Pallant et al., 2025).

Previous studies have consistently demonstrated the positive impact of digital technologies on learning outcomes in Akidah Akhlak education. Jamil and Thohir (2023) reported that asynchronous video-based learning significantly improved students' academic achievement by increasing flexibility and accessibility in learning. Similarly, Rochmat and Niyafatin (2026) found that the implementation of Augmented Reality media had a significant positive effect on students' learning outcomes by enhancing visualization and engagement. Moreover, Lapamu et al. (2026) concluded that digital technology integration positively influenced students' learning motivation, indicating that technology-supported instruction can create more engaging educational experiences. Collectively, these findings suggest that digital innovation has considerable potential to improve both cognitive and affective aspects of learning in Islamic education. Nevertheless, the technologies examined in these studies primarily function as instructional media rather than intelligent systems capable of adapting learning experiences to individual learner characteristics and needs.

Although previous research confirms the benefits of digital technologies in educational contexts, important gaps remain in the existing literature (Hidayati et al., 2025). Most studies have focused on conventional digital tools, multimedia resources, or emerging technologies such as Augmented Reality, while empirical investigations concerning AI-based learning systems remain limited. Furthermore, existing AI-related studies have predominantly examined subjects outside Islamic education, leaving uncertainty regarding the effectiveness of AI-supported learning in fostering students' understanding of Akidah Akhlak concepts (Kurtz et al., 2024). Given that Akidah Akhlak emphasizes moral reasoning, ethical decision-making, and contextual application of religious values, the effectiveness of AI-assisted learning in this domain cannot be assumed based solely on findings from other disciplines. Consequently, there remains a critical need for empirical evidence that specifically evaluates how AI technologies, particularly Gemini AI, influence

students' understanding and engagement within Islamic religious education. Addressing this gap is essential for expanding scholarly knowledge regarding the pedagogical potential of AI in faith-based educational settings (Rahmawati et al., 2025).

The novelty of this study lies in its examination of Gemini AI as an instructional intervention within Akidah Akhlak learning, a context that has received limited scholarly attention. Unlike previous studies that investigated general digital technologies, this research focuses specifically on a multimodal AI system capable of delivering personalized responses, facilitating interactive discussions, and supporting contextual exploration of ethical issues relevant to students' daily lives. The study also extends current knowledge by connecting AI-assisted learning with contemporary moral challenges encountered in digital environments, particularly issues related to social media ethics. By integrating AI technology into Islamic education, this research contributes to the emerging discourse on how intelligent systems can support moral and character education. Therefore, the study offers both theoretical and practical contributions by expanding the application of AI in religious education and providing insights into innovative pedagogical approaches suitable for digitally oriented learners.

Based on the aforementioned issues and research gaps, this study seeks to analyze the effect of Gemini AI-assisted learning on students' understanding of Akidah Akhlak. The underlying argument of this research is that Gemini AI can enhance learning outcomes by providing adaptive, interactive, and contextually relevant learning experiences that encourage active student participation. Through personalized feedback, multimodal content delivery, and opportunities for inquiry-based learning, Gemini AI is expected to facilitate deeper conceptual understanding and improve students' ability to relate moral values to real-world digital challenges. Therefore, this study hypothesizes that the implementation of Gemini AI-assisted learning will significantly improve students' understanding of Akidah Akhlak compared to their level of understanding before the intervention. The findings are expected to contribute empirical evidence regarding the effectiveness of AI-based learning technologies and provide practical recommendations for integrating intelligent educational tools into Islamic education in the digital era.

RESEARCH METHODS

This study employed a quantitative approach using a pre-experimental one-group pretest–posttest design. The selection of this design was based on the objective of examining the effect of Gemini AI-assisted learning on students' understanding of Akidah Akhlak. In this design, a single group of participants was assessed before and after the intervention, allowing the researchers to

measure changes in students' understanding attributable to the treatment. Initially, students completed a pretest to determine their baseline level of understanding. Subsequently, they participated in learning activities supported by Gemini AI, followed by a posttest to evaluate changes in their comprehension after the intervention. This design is considered appropriate for assessing the effectiveness of an instructional treatment when comparison groups are unavailable and when the primary focus is on measuring learning gains within the same group of participants (Arliana et al., 2022).

The study was conducted at MTs Nahdlatul Wathan Licin during the 2025/2026 academic year (April–May 2026). The school was selected because preliminary observations indicated that students experienced difficulties in relating Akidah Akhlak concepts to contemporary digital-life issues and that classroom instruction remained predominantly teacher-centered. The population consisted of all eighth-grade students, totaling 28 participants. Given the relatively small population size, total sampling was employed, whereby all members of the population were included as research participants. This sampling technique ensured equal exposure to the intervention and enabled comprehensive monitoring of students' learning progress throughout the study (Hasfiana et al., 2026). Data were collected using an essay-based test consisting of five analytical questions designed to assess students' understanding of Akidah Akhlak, particularly the topic of social media ethics. The instrument was selected because essay questions provide deeper insights into students' conceptual understanding and their ability to apply knowledge to real-life situations. Prior to administration, the instrument underwent validity and reliability testing to ensure its suitability as a measurement tool (Putri et al., 2024).

The research procedure consisted of four stages: preliminary observation, pretest administration, implementation of Gemini AI-assisted learning, and posttest administration. Data obtained from the pretest and posttest were analyzed using both descriptive and inferential statistics. Descriptive analysis was employed to summarize students' learning outcomes through measures such as mean scores, score distributions, percentages, and overall performance trends. Before hypothesis testing, the normality assumption was examined using the Shapiro–Wilk test because the sample size was fewer than 50 participants. A homogeneity test was subsequently conducted to determine the equality of variances. After all assumptions were satisfied, a paired-sample t-test was performed to identify whether a statistically significant difference existed between pretest and posttest scores. Furthermore, effect size analysis was conducted to determine the magnitude of the impact of Gemini AI-assisted learning on students' understanding of Akidah Akhlak.

RESULTS AND DISCUSSION

Results

Instrument Validity Test

Prior to data collection, the instrument was tested on students who had previously studied the topic of social media ethics. The validity of the five essay items was analyzed using the Pearson Product-Moment correlation technique in IBM SPSS Statistics 27. An item was considered valid if the calculated correlation coefficient (r-value) exceeded the critical value of 0.374 and the significance level was below 0.05.

Table 1. Correlation Matrix of Instrument Items and Total Score

	Item 1	Item 2	Item 3	Item 4	Item 5	Total Score
Item 1 (Pearson Correlation)	1	.555**	.421*	.553**	.357	.826**
Sig. (2-tailed)	-	.002	.026	.002	.062	.000
N	28	28	28	28	28	28
Item 2 (Pearson Correlation)	.555**	1	.126	.416*	.315	.699**
Sig. (2-tailed)	.002	-	.522	.028	.102	.000
N	28	28	28	28	28	28
Item 3 (Pearson Correlation)	.421*	.126	1	.318	.253	.572**
Sig. (2-tailed)	.026	.522	-	.099	.194	.001
N	28	28	28	28	28	28
Item 4 (Pearson Correlation)	.553**	.416*	.318	1	.344	.752**
Sig. (2-tailed)	.002	.028	.099	-	.073	.000
N	28	28	28	28	28	28
Item 5 (Pearson Correlation)	.357	.315	.253	.344	1	.658**
Sig. (2-tailed)	.062	.102	.194	.073	-	.000
N	28	28	28	28	28	28
Total Score (Pearson Correlation)	.826**	.699**	.572**	.752**	.658**	1
Sig. (2-tailed)	.000	.000	.001	.000	.000	-
N	28	28	28	28	28	28

Note. $p < .01$; $p < .05$.

Table 1 shows that the correlation coefficients between each item and the total score ranged from 0.572 to 0.826. All items had significance values below 0.05, indicating that each item was positively associated with the total score.

Table 2. Summary of Instrument Validity Analysis

No.	r-value	r-table	Decision
1	0.826	> 0.374	Valid
	0.000	< 0.05	Valid
2	0.699	> 0.374	Valid
	0.000	< 0.05	Valid
3	0.572	> 0.374	Valid

	0.001	< 0.05	Valid
4	0.752	> 0.374	Valid
	0.000	< 0.05	Valid
5	0.658	> 0.374	Valid
	0.000	< 0.05	Valid

Table 2 shows that all five items obtained r-values greater than the critical value of 0.374 and significance values lower than 0.05. Therefore, all items met the validity criteria and were suitable for use as research instruments.

Instrument Reliability Test

After all items were declared valid, the reliability of the instrument was examined using Cronbach's Alpha.

Table 3. Reliability Test Results

Cronbach's Alpha	Number of Items
0.745	5

Table 3 shows that the instrument achieved a Cronbach's Alpha coefficient of 0.745, indicating adequate internal consistency and reliability.

Normality Test

Following the validity and reliability analyses, the pretest and posttest data were subjected to a normality test using the Shapiro–Wilk procedure.

Table 4. Pretest and Posttest Scores

No.	Student	Pretest	Posttest
1	AH	50	85
2	AR	60	85
3	AS	40	75
4	AF	55	90
5	FA	70	95
6	IN	45	80
7	KD	50	85
8	LZ	65	95
9	LF	35	75
10	LQ	60	90
11	MA	55	85
12	MF	65	100
13	MF	50	80
14	MH	45	80
15	MI	60	95
16	MM	55	90
17	MN	40	75

18	MS	70	95
19	NZ	50	80
20	NY	65	90
21	QA	45	80
22	RS	55	85
23	SP	60	90
24	SM	35	75
25	SZ	60	95
26	VA	50	85
27	YD	55	90
28	YA	65	90

Table 4 shows that posttest scores were consistently higher than pretest scores across most participants, indicating an improvement in students' performance following the intervention.

Table 5. Normality Test Results

Variable	Kolmogorov-Smirnov Statistic	df	Sig.	Shapiro-Wilk Statistic	df	Sig.
Pretest	.124	28	.200*	.957	28	.295
Posttest	.164	28	.051	.932	28	.071

Note. This is a lower bound of the true significance.

Table 5 shows that the Shapiro–Wilk significance value for the pretest was 0.295 and for the posttest was 0.071. Both values exceeded 0.05, indicating that the data were normally distributed.

Homogeneity Test

A homogeneity test was conducted to determine whether the variances of the pretest and posttest scores were equal.

Table 6. Homogeneity of Variance Test

Test	Levene Statistic	df1	df2	Sig.
Based on Mean	2.590	1	54	.113
Based on Median	2.123	1	54	.151
Based on Median and with Adjusted df	2.123	1	48.371	.152
Based on Trimmed Mean	2.517	1	54	.118

Table 6 shows that the significance value based on the mean was 0.113, which was greater than 0.05. Therefore, the variance of the data was homogeneous.

Paired-Sample t-Test

After the assumptions of normality and homogeneity were satisfied, a paired-sample t-test was performed to examine differences between pretest and posttest scores.

Table 7. Paired-Sample t-Test Results

Paired Differences	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pretest – Posttest	-32.321	4.406	.833	-34.030	-30.613	-38.819	27	.000

Table 7 shows that the significance value (2-tailed) was 0.000, which was lower than 0.05. The mean difference between pretest and posttest scores was -32.321 points, indicating a statistically significant difference between the two measurements.

Effect Size Analysis

An effect size analysis was conducted to determine the magnitude of the intervention effect.

Table 8. Interpretation Criteria for Cohen's d

Cohen's d Value	Interpretation
$d < 0.20$	Very Small
$0.20 \leq d < 0.50$	Small
$0.50 \leq d < 0.80$	Medium
$d \geq 0.80$	Large

Table 8 shows that effect size values equal to or greater than 0.80 are categorized as having a large effect.

Table 9. Effect Size Results

Pair	Standardizer	Point Estimate	Lower CI	Upper CI
Pretest – Posttest (Cohen's d)	4.406	-7.336	-9.312	-5.352
Pretest – Posttest (Hedges' correction)	4.468	-7.234	-9.182	-5.277

Table 9 shows that the Cohen's d value was 7.336 and the Hedges' correction value was 7.234. These values indicate a very large effect of the intervention on students' understanding of Akidah Akhlak.

Discussion

The results of this study indicate that Gemini AI-assisted learning has a significant effect on students' understanding of Akidah Akhlak, particularly regarding social media ethics. This finding is supported by the paired-sample t-test result, which yielded a significance value of 0.000 ($p < 0.05$), indicating a statistically significant difference between students' pretest and posttest scores. Furthermore, the effect size value of 7.336 falls within the very large category, suggesting that the intervention had a substantial impact on students' understanding. Prior to hypothesis testing, the data met the assumptions of normality and homogeneity, with significance values exceeding 0.05. The fulfillment of these assumptions ensured the appropriateness of parametric statistical analysis and strengthened the validity of the study's conclusions. This finding is consistent with Ikram et al. (2026), who emphasized the importance of meeting statistical assumptions before conducting hypothesis testing to ensure reliable results.

The improvement in students' understanding following the implementation of Gemini AI-assisted learning suggests that artificial intelligence can effectively support deeper knowledge construction and meaningful learning experiences. During the learning process, students were actively engaged in asking questions, exploring concepts, discussing ideas, and analyzing situations related to social media ethics. Such learning activities encouraged students to move beyond rote memorization and develop a more comprehensive understanding of the subject matter. From a theoretical perspective, these findings support constructivist learning theory, which posits that learners actively construct knowledge through interaction with learning resources and meaningful experiences. In this study, Gemini AI functioned as an interactive learning facilitator that provided immediate access to information and feedback, thereby enriching students' learning experiences and promoting active engagement in the learning process.

The findings of this study are consistent with those reported by Jamil and Thohir (2023), who found that the integration of technology in Akidah Akhlak learning contributed positively to students' learning outcomes. This similarity suggests that technology-enhanced learning environments can improve both the learning process and academic achievement in Islamic education. Likewise, the results align with the study conducted by Rochmat and Niyafatin (2026), which demonstrated that Augmented Reality-based media significantly improved student learning outcomes (Forester et al., 2024). Although the technologies employed differ, both Augmented Reality and Gemini AI provide interactive learning experiences that encourage student participation and engagement. Therefore, the present findings reinforce existing evidence that technological innovation can play an important role in enhancing the effectiveness of educational practices.

Despite these similarities, the present study offers a distinct contribution to the literature. Previous studies have primarily focused on digital learning media and visual technologies, whereas research examining the use of generative artificial intelligence in Islamic education remains limited. The novelty (state of the art) of this study lies in its investigation of Gemini AI as a generative AI tool to enhance students' understanding of social media ethics within Akidah Akhlak learning. This focus extends current knowledge by demonstrating that generative AI can be applied not only in general educational contexts but also in the teaching of ethical values, character development, and Islamic moral principles. Consequently, this study contributes new empirical evidence regarding the potential of generative AI to support value-based education in the digital era.

The results are further supported by the findings of Lapamu et al. (2026), who reported that the integration of digital technology in Akidah Akhlak learning positively influenced students' learning motivation. Increased motivation is likely to foster greater engagement in learning activities, which in turn contributes to improved understanding of the subject matter. Similarly, Haris (2025) found a positive relationship between the use of information and communication technology and students' learning outcomes in Akidah Akhlak. The present study expands upon these findings by demonstrating that AI-based technologies not only enhance motivation and learning outcomes but also strengthen conceptual understanding through adaptive, interactive, and personalized learning experiences. This suggests that generative AI has the potential to address diverse learning needs while promoting more effective learning processes (Hiza et al., 2026).

The findings of this study have both theoretical and practical implications. Theoretically (Rahmani et al., 2025), the study strengthens the growing body of literature on the effectiveness of generative artificial intelligence in educational settings, particularly within Islamic education. It provides empirical support for the argument that AI-assisted learning can facilitate active knowledge construction and improve conceptual understanding. Practically, the findings suggest that Gemini AI can serve as an innovative supplementary learning tool that supports classroom instruction without replacing the role of teachers. Teachers remain responsible for guiding learning activities, providing explanations, and ensuring that learning objectives are achieved, while Gemini AI functions as a complementary resource that enriches students' learning experiences. Therefore, this study contributes valuable insights for educators and educational institutions seeking to integrate AI technologies into teaching practices and demonstrates the potential of generative AI as an effective instructional innovation for enhancing students' understanding of Akidah Akhlak in the digital age.

CONCLUSION

This study demonstrates that Gemini AI-assisted learning significantly enhances students' understanding of Akidah Akhlak, particularly regarding social media ethics, as evidenced by the significant paired-sample t-test result ($p < 0.05$) and the very large effect size (Cohen's $d = 7.336$). The most important insight from this finding is that generative artificial intelligence can serve as an effective learning support tool that promotes deeper conceptual understanding through interactive exploration, discussion, and critical engagement with learning materials. From a scholarly perspective, this study contributes to the growing body of literature on artificial intelligence in education by providing empirical evidence of the effectiveness of Gemini AI within the context of Islamic education, an area that has received limited attention in previous research. The study also extends current knowledge by demonstrating the potential of generative AI to support the teaching of ethical and value-based content, particularly in Akidah Akhlak learning. Nevertheless, this research is limited by the use of a pre-experimental design without a control group and a relatively small sample drawn from a single Islamic junior secondary school, which may restrict the generalizability of the findings. Therefore, future studies are recommended to employ quasi-experimental or experimental designs involving larger and more diverse samples across different educational settings to further validate and expand upon the findings of this study.

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