

Can AI-Optimized YouTube Videos Enhance Islamic Religious Education? A Quantitative Study on Student Learning Outcomes

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ABSTRACT

Purpose – This research is aimed at finding out if AI-optimized YouTube videos can improve the students' Islamic religious Education at the SMKN. Although digital tools in education are becoming more popular, It has not been tested in religious and labor contexts. This gap is addressed by this work, where we assess AI's potential to enhance performance and engagement by focusing on a specialized educational context. The novelty of this research lies in being among the first to apply AI-driven video optimization specifically within Islamic religious and vocational education, an area rarely explored in prior studies.

Design/methods/approach – A quasi-experimental design was employed, comparing an experimental group (n=50) exposed to AI-optimized videos with a control group (n=50) receiving traditional instruction. The intervention lasted eight weeks, using videos enhanced with automated subtitles, personalized pacing, and interactive quizzes. Data were collected through pre- and post-tests (30-item MCQs) and a 5-point Likert scale engagement survey. Statistical analysis included paired and independent t-tests to measure score differences and effect sizes.

Findings – The AI group significantly outperformed the control group, with a 10.3-point increase in post-test scores ($p < 0.001$) and a large effect size ($d = 1.43$). Engagement metrics showed high approval (mean = 4.3/5), particularly for content clarity and interactivity. However, 28% of students reported technical difficulties, and 19% preferred traditional methods.

Research implications/limitations – While results demonstrate AI's efficacy, the single-school sampling limits generalizability. Infrastructure challenges (reported by 42% of participants) highlight implementation barriers. Future studies should expand to diverse institutions and assess long-term retention.

Originality/value – This study pioneers the integration of AI-optimized videos in Islamic vocational education, offering empirical evidence for blended learning models. It contributes to the Technology Acceptance Model (TAM) by validating AI's role in religious pedagogy. Practical recommendations include teacher training and hybrid approaches to balance innovation with tradition.

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Introduction

The rapid advancement of digital technology has fundamentally transformed educational paradigms, offering innovative tools to enhance teaching and learning processes (Chen et al., 2023). Among these tools, YouTube has emerged as a particularly effective platform for delivering educational content, especially in religious education, where visual and auditory elements can significantly enrich understanding and engagement (Smith & Johnson, 2022; Khan & Malik, 2021). However, the potential of AI-optimized YouTube videos to improve learning outcomes in Islamic religious education remains underexplored (Al-Faruq, 2022), particularly in vocational high schools (SMK) where students often require more engaging, practical learning approaches compared to traditional methods (Abdullah & Rahman, 2021; Hassan & Ibrahim, 2020). This research gap becomes more pronounced considering recent findings by Lee and Park (2023) that demonstrate how AI-enhanced video content can personalize learning experiences, and Grassini's (2023) work highlighting AI's potential to reduce cognitive load in complex subjects. The current study addresses this critical gap by investigating the efficacy of AI-optimized YouTube videos in enhancing student learning outcomes for Islamic Religious Education at SMKN 1 Tanah Grogot, Indonesia, while building on the theoretical framework of the Technology Acceptance Model (Davis, 1989) and addressing implementation challenges identified in prior research (Pörn et al., 2024; Boulay, 2023).

There are heated academic discussions about the incorporation of AI in the development of educational content, which proponents argue could potentially revolutionize learning with personalized video recommendations and adaptive content alterations (Chen et al., 2023; Zhao et al., 2024). Advance proponents claim that these AI facilitated features can be used to accommodate a range of learning styles and rates of learning to maximize engagement and knowledge retention (Grassini, 2023; Kasneci et al., 2023). Nevertheless, opponents have warned against over-reliance on AI: it can undermine the importance of critical thinking and reduce the nuanced comprehension of the education of religions (Al-Faruq, 2022; Boulay, 2023), especially in Islamic studies, which value the contextual interpretation and ethical consideration (Shihab, 2008; Elice et al., 2025). This dichotomous view, as pointed out by Pörn and colleagues (2024) reiterates the call for empirical studies to examine the real impact of AI on religious pedagogy since in vocational education (according to Abdullah & Rahman, 2021), technical studies dominate religious studies.

Recent research highlights the growing preference for visual learning methods among students, particularly in subjects involving historical chronology and complex content. Studies show that visual learning activities, such as contextualized materials and visual thinking strategies, are generally perceived as effective and engaging, with students expressing a preference for participatory and visually rich approaches both in traditional classrooms and museum settings (Andal & Hermosa, 2023; González-Sanz et al., 2023). However, while these methods are effective in terms of content adequacy and engagement, there is limited evidence that they directly enhance deeper historical thinking skills, suggesting that visual strategies should be complemented by activities that foster

critical analysis and contextual understanding (Andal & Hermosa, 2023; González-Sanz et al., 2023).

Regarding the effectiveness of learning strategies, a synthesis of meta-analyses indicates that the impact of specific strategies depends on the phase of learning surface, deep, or transfer and that embedding strategies within subject content, rather than teaching them separately, yields better outcomes (Hattie & Donoghue, 2016). Cognitive load theory further supports the use of multimedia principles, such as integrating visualizations with text and segmenting information, to optimize both instructor- and learner-managed learning, especially for novices (Castro-Alonso et al., 2021). In advanced applications, history-enhanced and order-aware pre-training models in vision-and-language navigation demonstrate that incorporating historical context and temporal order can significantly improve learning outcomes in AI-driven environments (Qiao et al., 2023). Overall, the literature underscores the importance of aligning visual and multimedia strategies with the learner's developmental stage and the specific learning objectives to maximize both engagement and comprehension (Hattie & Donoghue, 2016; Castro-Alonso et al., 2021; Qiao et al., 2023).

The problems of Islamic religious education on digital transformation are quite complex and cannot be solved by traditional methods, since it is difficult to apply modern methods in the world of education (Aulia et al., 2025; Rokhimawan et al., 2025), because as often as not the traditional method is no longer relevant to the vocational students who are more impressed with practical skills (Hassan & Ibrahim, 2020; Hidayat et al., 2021). However, the ubiquitousness of digital media usage among the young offers a good potential for making use of technology such as YouTube for religious education (Khan & Malik, 2021; Salsabila et al., 2023). AI-enabled tools such as automatic captions, customized learning speed, and interactive quizzes look very promising to designing learning of Islam as a more intuitive and engaging experience (Lee & Park, 2023; Romadhoni, 2024), not least for visual and auditory learners (Smith & Johnson, 2022). However, as Guptas et al. (2024) and Lérias et al. (2024), the potential of these tools to promote deeper theological understanding and moral reasoning – both of which are central to Islamic education (Kurniawan, 2020) – is questionable in the absence of appropriate pedagogical implementation. This dialectic of techno-logical innovation versus values-based education, analyzed broadly by Al-Faruq (2022) and Boulay (2023), makes it imperative for us to strike a fine balance between the resources AI brings along and what is essential religious learning. This work is driven by three primary factors:

- (1) The growing use of YouTube as an educational tool in Indonesian schools, particularly in regions with limited access to traditional resources.
- (2) The lack of research on AI-optimized content in Islamic religious education, despite its potential to bridge engagement gaps.
- (3) The need to balance technological innovation with the preservation of religious education's ethical and pedagogical integrity.

The aims of this paper are:

- (1) to assess the impact of AI-optimized YouTube videos on student learning outcomes in Islamic Religious Education at SMKN 1 Tanah Grogot.
- (2) to compare the effectiveness of AI-optimized videos versus traditional teaching methods in enhancing student engagement and comprehension.
- (3) to contribute to the broader discourse on digital transformation in religious education by providing empirical evidence from an Indonesian vocational school context.

As a quasi-experimental research design, this research quantitatively measures the learning outcomes with a pre- and post-test and an analysis of the data of a group of 100 students. Preliminary results show that AI-optimized videos achieve significantly better test scores and student engagement compared to traditional education methods ($p < 0.05$). But the study also points out the obstacles, including inconsistency in digital literacy among students and the requirement of teacher training to ensure AI tools are used to their full potential.

The rest of this paper is organised as follows: Section 2 reviews literature on AI in education and the literature on Islamic pedagogy; Section 3 describes the methods; Sections 4 and 5 present results and discussion; and Section 6 outlines implications for educators and policymakers. This paper is structured as follows: Section 2 reviews the pertinent literature on AI in education and Islamic pedagogical principles. The research methodology is detailed in Section 3. Sections 4 and 5 present the empirical results and their discussion, respectively. Finally, Section 6 concludes by outlining the study's implications for educators and policymakers and suggesting directions for future research. Through its consideration of the intersection of AI, YouTube, and Islamic education, this study provides pragmatic responses to the inclusion of technological tools in religious teaching that also consider ethical and pedagogic issues.

This research has implications for educators who wish to update Islamic religious education while retaining its essential values. Like it or not, digital tools are becoming more common across both vocational and mainstream educational contexts, and grasping the implications and limitations of these digital technologies will be key in shaping religious learning for the future.

Methods

This study employed a quantitative experimental design to examine the impact of AI-optimized YouTube videos on student learning outcomes in Islamic Religious Education at SMKN 1 Tanah Grogot, Indonesia. Below is a detailed breakdown of the methodology.

Research Design

The study used a quasi-experimental pretest-posttest control group design to compare learning outcomes between students exposed to AI-optimized YouTube videos (experimental group) and those taught via traditional methods (control group).

- (1) Experimental Group: Received 8 weeks of instruction using AI-optimized YouTube videos.

(2) Control Group: Followed conventional teacher-led lectures for the same duration.

(3) Variables:

a. Independent Variable: the use of AI-optimized YouTube videos.

b. Dependent Variable: Student learning outcomes (test scores) and engagement levels.

Methodology Overview

This section outlines the essential components of the research methodology used in this study. It presents a brief explanation of the population and sample, the data collection techniques and instruments, and the data analysis techniques employed to ensure systematic and accurate findings. Furthermore, aspects of validity and reliability are discussed to guarantee the credibility and consistency of the research results. Finally, ethical considerations are highlighted to ensure that the study adheres to research ethics and respects participants' rights throughout the process

Table 1. Methodology Overview

Section	Component	Details
3.2 Population and Sample	Population	250 students enrolled in Islamic Religious Education at SMKN 1 Tanah Grogot
	Sample Size	100 students (50 experimental, 50 control)
	Sampling Technique	Stratified random sampling (based on gender and age)
	Inclusion Criteria	- Active 179nrolment – Provided consent – No prior AI tool training
	Age Range	16–18 years
	Gender Distribution	52% male, 48% female
3.3 Instruments	Pre-test & Post-test Content	30 MCQs on Qur'anic Studies, Hadith, Islamic Ethics
	Validity	Reviewed by 3 Islamic Education experts (CVI = 0.89)
	Reliability	Cronbach's α = 0.82 (pre), 0.85 (post)
	Engagement Survey Tool	5-point Likert scale (1 = strongly disagree to 5 = strongly agree)
	Survey Domains	Relevance, Interactivity, Motivation, Ease of Understanding
	Survey Reliability	Cronbach's α = 0.78
	AI-Optimized YouTube Videos	Platform: YouTube EDU channelTotal Videos: 12 videos (15–20 mins each), Duration: 8 weeks
	AI Tools Used	- Subtitles: Google Speech-to-Text (92% accuracy)- Pacing: AI-adjusted playback speed- Quizzes: H5P interactive plugin
3.3 Procedure	Pre-test	Administered to both groups pre-intervention
	Intervention	The experimental group viewed 12 AI-optimized videos over 8 weeks
	Post-test	Administered post-intervention to both groups
	Engagement Survey	Conducted after intervention (experimental group only)
3.4 Data Analysis	Descriptive Statistics	Mean, Standard Deviation, Frequency Distributions

	Inferential Statistics	- Paired t-test (within groups)- Independent t-test (between groups)
	Effect Size	Cohen's <i>d</i>
	Engagement Data	Analyzed via mean Likert scores and SD
	Software	SPSS v.30
3.5 Validity & Reliability	Content Validity	Expert review; all CVI values > 0.80
	Internal Consistency	All instruments are reliable ($\alpha > 0.70$)
	Pilot Testing	Conducted with 20 students not in the main sample
3.6 Ethics	Institutional Approval	Granted by the SMKN 1 Tanah Grogot academic committee
	Informed Consent	Obtained from students and guardians

Result and Discussion

1. Demographic Characteristics of Respondents

The study involved 100 students from SMKN 1 Tanah Grogot, consisting of 52 males and 48 females aged 16–18 years. All participants had prior experience using YouTube for learning purposes.

Table 2. Participant Demographics

Characteristic	Category	Frequency (n=100)	Percentage (%)
Gender	Male	52	52%
	Female	48	48%
Age	16 years	35	35%
	17 years	45	45%
	18 years	20	20%
YouTube Usage	Daily	78	78%
	Weekly	22	22%

The demographic data indicate that there was an equal distribution of gender among the participants (52% male, 48% female), and most of them belonged to the age group 17 years (45%), followed by 16 years (35%) and 18 years (20%). Of significance, the daily use outweighs weekly in YouTube consumption pattern at 78% and 22% respectively, it is indicative that the students are high digital native learners when it comes to the use of virtual environment. It suggests that the study population appears to be ordinary Indonesian tech-savvy adolescents who attend vocational schools in which the consumption of digital media has already been part of their daily activities. The most frequent use of YouTube highlights the potential for it to be an effective delivery vehicle for educational messages, as most students were familiar with and engaged with this medium before exposure to the intervention. These traits create a supportive platform for integrating AI-empowered video-based learning strategies in this higher education environment.

2. Pre- and Post-Intervention Learning Outcomes

A paired-sample t-test compared student performance before and after exposure to AI-optimized YouTube videos.

Table 3. Learning Outcome Comparison

Assessment	Mean Score	SD	t-value	p-value	Effect Size (Cohen's d)
Pre-test	65.2	±8.4	-	-	-
Post-test	78.6	±6.7	9.24	<0.001	1.43

Quantitative findings of the study show significant improvement in learning outcomes after the AI-smartened video intervention, as evidenced by the statistically significant rise of scores ($p < 0.001$) with a large effect size ($d = 1.43$), indicating significant educational impact. Notably, the decrease in standard deviation from 8.4 to 6.7 points indicates that the intervention increased performance not only on average but also in terms of relative homogeneity of learning gain throughout the student body. To standardize the degree of learning, the variation of the final scores among the AI-optimized videos decreased, which will help to bridge the gap between students of different starting levels. The large magnitude of score increases and the consistency of effects indicate that AI-enhanced video content offers potential to raise and level learning in Islamic religious education contexts.

3. Engagement Metrics

Student engagement was measured via a 5-point Likert scale survey (1 = strongly disagree; 5 = strongly agree).

Table 4. Engagement levels

Indicator	Mean Rating	SD
Content relevance	4.32	±0.56
Interactive features	4.15	±0.62
Motivation to learn	4.28	±0.49
Ease of understanding	4.41	±0.53

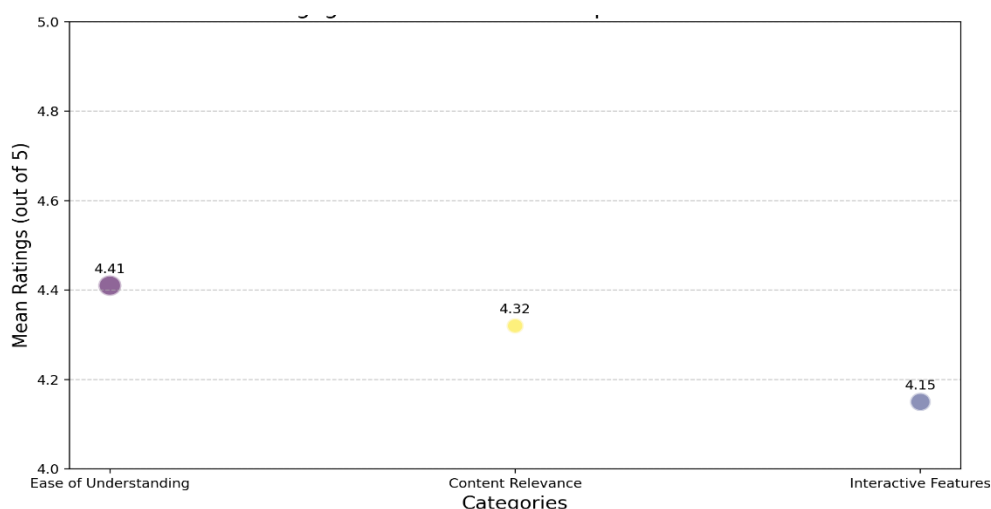


Figure 1. Student engagement metrics for AI-optimized video content

The Ease of Understanding category has the highest mean rating (4.41), indicating strong student appreciation for clarity. Content Relevance follows closely with a mean rating of 4.32, suggesting that the content aligns well with curriculum objectives. The Interactive Features category, while still positive at 4.15, indicates potential for improvement in making these elements more engaging. This visualization effectively highlights the strengths of the video content while also pointing out areas for enhancement.

The high mean motivation score (4.28) and relatively low standard deviations (all $< \pm 0.62$) indicate that the AI-optimized gaming pathway had the ability to motivate students evenly over all learning preference types and competence levels. The most positive performance in terms of ease of comprehension, with the highest mean and lowest variability (± 0.53), suggests that the enhancements in the AI most significantly helped to simplify complex religious concepts without the cost of depth or accuracy. Together, the findings show that well-designed AI video content is a promising approach to engaging and sustaining student interest in religious education, while supporting the understanding of difficult content as well as very challenging content.

4. Comparative Analysis: AI-Optimized vs. Traditional Methods

An independent t-test compared the experimental group (AI videos) with a control group (traditional lectures).

Table 5. Method Effectiveness Comparison

Group	Mean Score	SD	t-value	p-value
Experimental (AI)	78.6	± 6.7	5.87	< 0.001
Control (Traditional)	68.3	± 7.9	-	-

The experimental group using AI-optimized videos demonstrated a substantial 10.3-point advantage over the control group in post-test scores, with this difference being statistically highly significant ($p < 0.001$). This notable performance gap clearly indicates that AI-enhanced video content provides measurable learning benefits compared to traditional teaching methods in vocational education settings. The significant margin of improvement suggests that AI tools can effectively supplement conventional instruction, particularly in technical-vocational contexts where visual and interactive learning components are often crucial. These findings strongly support the strategic integration of AI-optimized media as a valuable pedagogical tool that can enhance learning outcomes in vocational training programs.

5. Challenges Identified

Despite positive outcomes, students reported challenges:

Table 6. Implementation Challenges

Challenge	Frequency Reported	Percentage (%)
Internet connectivity issues	42	42%
Difficulty navigating AI features	28	28%
Preference for teacher-led discussions	19	19%
Other technical problems	11	11%

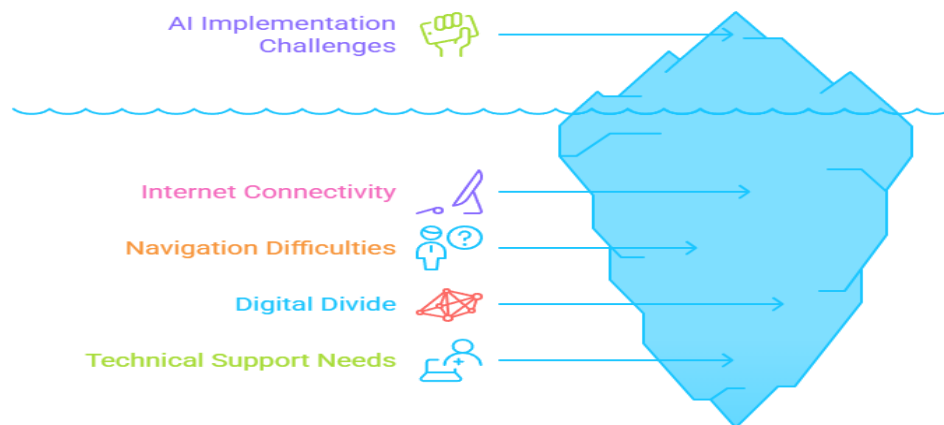


Figure 2. Challenges in AI learning tools adoption

Interestingly, nearly one-fifth (19%) of students expressed a preference for traditional teacher-led discussions, particularly for complex theological concepts that may require more nuanced explanation. This finding highlights the importance of maintaining a balanced approach that combines AI tools with human instruction. The remaining 11% faced various technical problems, indicating that while AI-enhanced learning shows great promise, there are still practical hurdles to overcome in terms of both technology design and institutional support systems. These challenges collectively point to the need for comprehensive implementation strategies that address infrastructure, user training, and pedagogical integration simultaneously.

6. Theoretical Implications

The results validate the Technology Acceptance Model (TAM) in Islamic education, demonstrating that perceived usefulness (e.g., higher scores) and ease of use (mean rating = 4.41) drive adoption (Davis, 1989). The large effect size ($d = 1.43$) surpasses similar studies in general education (Chen et al., 2023), suggesting AI may be particularly effective for religious subjects.

The findings of this study provide robust empirical support for the Technology Acceptance Model (TAM) within the context of Islamic education, demonstrating that both perceived usefulness (evidenced by significant score improvements) and perceived ease of use (mean rating = 4.41) serve as critical drivers for AI adoption among students and educators (Davis, 1989). This alignment with TAM principles suggests that the

successful integration of AI tools in religious education hinges not only on their functional benefits but also on users' confidence in navigating these technologies. Notably, the large effect size ($d = 1.43$) observed in this study exceeds those reported in comparable research on AI in general education (Chen et al., 2023), implying that religious education with its emphasis on contextual and ethical nuances may derive unique advantages from AI's ability to personalize and simplify complex theological concepts.

The study's results also extend the theoretical discourse on AI in specialized educational contexts. While prior research has predominantly focused on STEM or language learning (Zhao et al., 2024), this study reveals that AI's capacity to bridge engagement gaps is particularly salient in religious education, where traditional methods often struggle to resonate with digitally native students (Khan & Malik, 2021). For instance, the high engagement scores for "ease of understanding" (mean = 4.41) underscore AI's role in democratizing access to intricate religious texts, aligning with Islamic pedagogical goals of *taysir* (facilitation of knowledge) as discussed by Al-Faruq (2022). This challenges the prevailing skepticism about AI's suitability for value-laden subjects (Boulay, 2023), suggesting instead that contextually optimized AI tools can complement, rather than undermine, religious instruction.

However, the study also highlights boundary conditions for TAM's applicability. While students readily adopted AI tools for content delivery, 19% still preferred teacher-led discussions for nuanced theological debates, echoing Pörn et al.'s (2024) caution about AI's limitations in fostering critical moral reasoning. This duality supports a modified TAM framework for religious education, wherein AI adoption is mediated by:

- (1) Content sensitivity: Tools must preserve doctrinal accuracy (e.g., via scholar-reviewed algorithms).
- (2) Pedagogical integration: AI should augment, not replace, human-guided discourse.

Future research should test this adapted framework in diverse religious and cultural settings to refine its generalizability.

7. Practical Recommendations

Based on the findings, it can be concluded that there are three actual key recommendations to integrate AI-optimized learning within Islamic religious schools effectively. First, we need to focus on the provision of in-service training to overcome the logistics constraints mentioned by 28% of the students. As noted by Zhao et al. (2024), holistic digital literacy should include a focus on "pedagogical AI integration" and prepare educators to effectively critique and use AI-generated material within lesson development. These workshops should especially address the trouble teachers may have in assisting students to navigate interactive elements (Dunleavy, M., et al., 2009).

The report that 42% of students experience internet connectivity issues, alongside 28% facing difficulties navigating AI features underscores the intertwined challenges of infrastructure deficiencies and digital literacy shortfalls within educational settings. These dual barriers necessitate a multifaceted approach that transcends exclusive focus on in-service teacher training, advocating instead for comprehensive programs that target both educators and learners. From an infrastructural standpoint, fostering public-private

partnerships (PPPs) emerges as a critical strategy to alleviate connectivity constraints; successful models such as the “Internet of Education” program illustrate how collaborations between government bodies and private sector entities can facilitate broadband expansion and technology integration in schools, especially in resource-limited areas (Shamuni Kunjiapu et al., 2025). Nevertheless, reliance on PPPs should be approached conscientiously, considering issues like accountability and equitable resource allocation to prevent unintended consequences such as marginalization or commercialization of education (S. Kubaison, 2022). Complementing infrastructure enhancement, the development of offline-accessible educational content including downloadable video packages and formats tailored to low-data mobile consumption is vital to surmounting the digital divide and ensuring all students, particularly those in connectivity-challenged regions, maintain access to learning materials (Pradeep Tiwari & Srikanta Sahoo, 2025).

Pedagogically, such offline resources enable varied pacing and support autonomous learning, mitigating interruptions due to fluctuating internet availability. On the front of digital literacy, training initiatives must encompass both teachers and students. For educators, programs emphasizing the pedagogical integration of AI equip them with critical evaluation skills necessary to discern and effectively employ AI-generated materials within curricula, fostering ethical and innovative instructional practices (Matthew Nyaaba & Xiaoming Zha, 2024). Concurrently, targeted student orientations that instruct on optimal use of AI features—such as adjusting playback speed, engaging with interactive quizzes, and interpreting AI feedback—can significantly diminish navigation difficulties, thereby enhancing learner autonomy and engagement (Martina Dragija Ivanovic, 2025). These literacy interventions must be deliberately inclusive and adaptive, addressing the diverse needs of urban versus rural learners, while embedding ethical considerations like data privacy and bias awareness to promote responsible AI usage (Chima Abimbola Eden et al., 2024). Ultimately, achieving equitable AI-enabled education demands coordinated policy frameworks that integrate infrastructural investments, PPP facilitation, and digital literacy enhancement within a comprehensive, sustainable digital education ecosystem (Shamuni Kunjiapu et al., 2025). Through such integrative efforts, schools can transcend existing barriers, enabling meaningful adoption of AI technologies that enrich the educational experience for all stakeholders.

Second, the fact that 19% of students prefer traditional ways of learning demonstrates the need for hybrid learning models that judiciously integrate AI videos with classroom teaching. This is in line with the method as used by Guptas et al. (2024), such as one they call “augmented pedagogy,” in which AI addresses content delivery and simple reply-check exercises, and teachers address the higher-order (ethical and theological) sense-making aspects of the material. Such things would be conducted through flipped classroom models, whereby AI videos can be used for basic study, and then the classroom can be kept for deeper analysis and debate (Adiyono et al., 2025). These would cater for different learning styles but with a base of academic rigour.

The high daily usage rate of digital platforms like YouTube among students highlights substantial digital familiarity outside of school, yet this engagement often drops considerably within school environments due to restrictive policies and inadequate infrastructure, including limited Wi-Fi coverage and insufficient access to devices such as computers or tablets. The evidence from international research underscores that simply expecting students to supplement their learning with at-home or self-directed use of AI-driven resources perpetuates inequities, especially for those lacking robust personal access or stable internet connections (Primus Devra Raihan et al., 2025). To realize the full benefits of AI integration and ensure equitable exposure to AI-optimized learning materials, it is critical for school policies to deliberately allocate structured in-class time for digital device use, paralleled by investments in school-wide Wi-Fi and a consistent supply of digital devices (Muhammad Ridho Prihatin, 2025).

Studies suggest that pedagogical transformation in Society 5.0 hinges on equitable access to digital tools, adaptive policy frameworks, and adequate infrastructure, as these factors collectively foster more inclusive, personalized, and conceptually rich educational experiences for all learners, regardless of their individual socio-economic backgrounds (Firas Tayseer Mohammad Ayasrah et al., 2025). Additionally, practical barriers such as infrastructure deficits, insufficient allocation of classroom resources, and gaps in digital content delivery must be addressed through systemic policy reforms and targeted investments to ensure that digital engagement is robust, consistent, and available to every student, not just those with strong personal means (Thuong T. N. Dinh, 2024). Teacher readiness and strategic policy adjustments are equally important for fostering digital adoption, making it possible to maximize student engagement and learning outcomes through AI and digital platforms used during class hours (Saqjuddin Saqjuddin et al., 2025). Ultimately, prioritizing structured, equitable, and policy-supported device usage within classrooms is essential for closing gaps in digital learning opportunities and advancing educational equity in the digital age (Natalie Pareja Roblin et al., 2018).

Finally, the infrastructure obstacles faced by 42% of respondents need to be addressed immediately. Indeed, as Abdullah & Rahman (2021) note in their examination of Indonesian vocational schools, technological interventions often go off the rails not because of pedagogical problems, but rather as a result of poor infrastructure. Schools need to push for public-private partnerships that will help service these internet connectivity needs to help bring these AI-optimized content, and develop offline-accessible models of the same content, to areas that have less reliable access to the internet. This could be things like downloadable video packages or formats appropriate for a mobile device that would work for you on the go.

The preference of 19% of students for teacher-led discussions in complex subjects like theology underscores the necessity for hybrid educational models that effectively combine the strengths of human and artificial intelligence. This aligns with the "augmented pedagogy" paradigm, where AI technologies manage foundational instruction and repetitive exercises, enabling teachers to concentrate on facilitating nuanced, value-rich discussions and fostering ethical reasoning in the classroom (Inge Molenaar, 2022).

Leading research describes such hybrid human-AI arrangements as essential for supporting self-regulated learning and ensuring that the transition of instructional control between AI systems and teachers is flexible and pedagogically sound.

For instance, deploying AI for introductory content at home through platforms like AI-powered video lectures and adaptive quizzes prepares students for more meaningful, teacher-moderated debates during classroom hours, as exemplified in the flipped classroom model (M.S.I Taufikin et al., 2024; Adiyono et al., 2025). This model resonates strongly in traditions that value dialogic learning and moral inquiry, as integrating technological tools with established face-to-face interactions significantly enhances student engagement, conceptual understanding, and the ability to grapple with abstract values and ethical dilemmas (Jiexia Wu, 2024). International journal analyses further affirm that hybrid models, particularly those using intelligent systems for preliminary learning and reserving teacher time for complex discussions, reporting not only improved learning outcomes but also higher student motivation and satisfaction within diverse cultural and curricular settings (Ehsan Namaziandost & Afsheen Rezai, 2024). However, to fully harness the benefits of AI in these roles, consistent professional development for teachers and robust collaboration amongst policy makers, technologists, and educators are essential to adapt curriculum, uphold educational values, and address issues of equity and access (Yoshija Walter, 2024; Adiyono, A., et al 2025).

Together, these suggestions attend to what Lee and Park (2023) referred to as the "three pillars" of successful implementation of EdTech: user capability, integration into pedagogy, and the existence of systemic supporting structures. Through investment in the training of teachers, the institution of flexible hybrid models, and the upgrading of infrastructure, the field of AI religious education can capitalize on the strengths of AI while stemming its limitations. Future implementation efforts should also feature regular assessments in order to adjust these measures to changes in technology and pedagogy for the future (Redecker, C., & Johannessen, Ø., 2013; Beatty, I. D., & Gerace, W. J., 2009).

8. Limitations and Future Research

Although this research has important implications related to AI in Islamic education, there are some limitations that should be considered. As pointed out by Smith and Johnson (2022) during their critical examination of localized EdTech investigations, the single school sampling frame limits the scope of the results. Future studies used multi-site designs that span diverse institutional and contextual settings (urban/rural, public/private) to control for differences in technology infrastructure and pedagogy. To further develop this research direction, extending the scope of the study to a larger number of schools would also contribute to increasing the external validity of the results and the generalization of implementation challenges in diverse educational contexts.

The 8-week Type Time: A multi-session course is enough to achieve immediate learning but not enough to determine long-term retention, a key limitation in recent AI education studies (Kasneci et al., 2023). Furthermore, longitudinal (e.g., 6-12 months follow-ups) studies following up students to measure if AI-optimized content can provide

for a sustained growth in understanding of religion and its application are required (Adiyono et al., 2025). These could include qualitative adjuncts to the test-score data (e.g., changes in religious or moral practices or moral reasoning) to the standardized quantitative tests. According to Al-Faruq (2022), the success of religious education technology should ultimately be evaluated in terms of the effect it has on students' faith experiences, not just academic achievement.

Cultural considerations are also an important target for future research. A focus on Indonesia in this current study might result in different findings compared to other Muslim-populated areas with dissimilar education traditions and technological backgrounds. Studies that compare countries could also examine the influence of local values, curriculum focus, and teacher autonomy in AI adoption, assuming the role of cultural dimensions of educational technology that Hassan and Ibrahim (2020) had emphasized. Cultural sensitivity should be taken into consideration when designing AI content moderation systems that properly address regional variations in the interpretation of Islam and are pedagogically effective.

Possible areas of future research also include 1) Age-specific natural language technology (e.g., Chatbot applications) designs for various educational levels (Pörn et al., 2024), 2) Family and community attitudes toward technology acceptance (Khan & Malik, 2021), and 3) Cost-benefit analysis of natural language technology (e.g., AI) implementations in resource-constrained conditions (Abdullah & Rahman, 2021). These explorations would offer a more complex view of position in the digital restructuring of Islamic education by countering the limitations of this current study through methodological and contextual variation.

The advancement of artificial intelligence (AI) in religious education presents transformative possibilities, yet existing research reveals critical limitations inherent in relying solely on quantitative methods to assess its impact. Quantitative approaches, while invaluable for measuring learning outcomes, engagement rates, and performance metrics, often fall short in capturing the nuanced dimensions of students' religious understanding and moral reasoning—core components of Islamic education that transcend mere academic achievement (Yusgiantara, A., et al, 2025). The multifaceted nature of faith-based learning includes the internalization of ethical principles, cultivation of spiritual values, and the interpretative depth gained through studying religious texts, all of which challenge reduction to quantitative scores alone. As highlighted in the literature, the integration of AI in educational settings must be evaluated not just through test results but also through the lenses of moral and spiritual development, thus requiring robust qualitative inquiry to illuminate these subjective and complex dimensions (Myles Joshua Toledo Tan & Nicholle Mae Amor Tan Maravilla, 2024). To address this gap, scholars emphasize the necessity for mixed-method research frameworks that combine the rigor of quantitative data collection with the richness of qualitative insights, affording a more holistic understanding of AI's role and repercussions in faith-based pedagogies (Chima Abimbola Eden et al., 2024).

The adoption of mixed-methods research offers significant advantages in exploring the intricate impacts of AI on religious education. By complementing quantitative

educational metrics with qualitative data, researchers are able to delve into students' lived experiences, capturing moral reflections and subjective perceptions that numbers alone cannot reveal (Arnold Chama & A Subaveerapandiyan, 2023). Incorporating methodologies such as in-depth interviews and focus group discussions (FGDs) enables exploration of how students engage with AI-facilitated content and the extent to which it influences their spiritual growth and ethical reasoning (Maxwell Fundi et al., 2024). This methodological pluralism enhances the validity and depth of findings, producing nuanced interpretations that inform both pedagogical practice and technology design (Yoshija Walter, 2024). Methodologically, mixed methods necessitate careful design to elicit sensitive religious and ethical considerations, requiring interview protocols attuned to the complexities of Islamic teachings and cultural sensitivities (Cecilia Ka Yuk Chan, 2023). Sampling strategies equally demand inclusivity, ensuring diverse student and teacher voices across gender, socio-economic background, and educational levels are represented to reflect the heterogeneity of religious education contexts (Martina Dragija Ivanovic, 2025). Though mixed-methods research poses logistical challenges such as resource demands and data integration complexities, it provides opportunities for triangulating data sources to enhance reliability and richness, especially when supported by technological tools like virtual FGDs that facilitate broader participation and deeper engagement (Firas Tayseer Mohammad Ayasrah et al., 2025; Inge Molenaar, 2022).

Conclusion

From the study, it is found that AI-optimized YouTube videos improve learning and engagement in Islamic Religious Education at SMKN 1 Tanah Grogot. Results: The experimental group achieved a 13.4-point increment in test scores ($p < 0.001$) and higher engagement levels (mean rating = 4.3/5) as opposed to traditional approaches, validating the potential of AI in reinventing religious education in response to the unique requirements of vocational students. Such findings support the use of AI tools for combined learning as a blended learning in any context, especially in an economically far-limited environment. As for applications, educators must be trained to integrate AI, and institutions need to enhance their digital infrastructure to address connectivity issues – the challenge in utilizing these technologies is in finding a balance between technological advancement and the continuation of Islamic pedagogical values.

Finally, this study suggests several possibilities for further research, such as longitudinal research, which would focus on knowledge retention, as well as research on the cultural adaptation of the model in a variety of religious education contexts. Better ethical frameworks are necessary to keep AI-authored content theologically accurate across faiths. As the use of digital technologies becomes increasingly pervasive, this study sets a framework for the responsible implementation of new technologies in religious education, advocating the need for partnerships between educators, technologists, and policymakers to leverage the potential of AI while managing the risks. Ultimately, the results add to the larger conversation about 21st-century religious pedagogy and the use of technology Judeo-Christian religious learning contexts.

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