

## Artificial Intelligence (AI) as A Learning Assistant for Islamic Education: A Study in Madrasah Ibtidaiyah

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### ABSTRACT

The artificial intelligence revolution has penetrated various sectors including in education, but its implementation in basic Islamic education remains limited and has not been comprehensively explored. This research aims to analyze the effectiveness of ChatGPT integration in improving understanding of Islamic concepts among Madrasah Ibtidaiyah (Islamic Elementary School) students. Using a mixed method approach with sequential explanatory design, this research involved 80 students from grades IV-VI from two Madrasah Ibtidaiyahs in Jember and 12 teachers and administrators. The experimental group received ChatGPT-assisted learning developed for basic *Aqidah Akhlak* (Islamic Creed and Ethics) and *Fiqh* (Islamic Jurisprudence) materials, while the control group followed conventional methods. The results showed a significant improvement in conceptual understanding in the experimental group (Cohen's  $d = 1.38$ ) compared to the control group. Qualitative analysis revealed important findings about the transformation of the teacher's role, the technology adaptation process, and AI integration models based on Islamic pedagogical principles such as *tawazun* (balance), *tabayyun* (verification), *uswah* (exemplary), and *ta'awun* (collaboration). The research results also showed that ChatGPT's effectiveness varied based on the type of material, with procedural materials such as *Fiqh* benefiting more compared to abstract conceptual materials such as *Aqidah*. This research contributes to the development of an integrative model of ChatGPT usage in Islamic education that enriches the learning experience while maintaining traditional values.

### KEYWORDS

*ChatGPT, Madrasah Ibtidaiyah, Islamic Education, Educational Technology*



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## Introduction

The era of digital technology disruption has fundamentally changed the global education landscape (Lee et al., 2022). Amid this transformation, Islamic education, particularly at the elementary level, faces unique challenges to adapt to technological advances while maintaining the essence of Islamic values that form its identity (Hasan & Shaleh, 2023). *Madrasah Ibtidaiyah*, an Islamic elementary educational institution, is strategically positioned to form the foundation of Islamic knowledge and character in the younger generation. However, data shows that technology adoption in Islamic elementary educational institutions still lags behind general educational institutions (Sabrin, 2018).

Artificial Intelligence (AI) offers transformative potential in education (Pretorius & Kotze, 2021). Its ability to analyze learning patterns, provide personalized feedback, and adapt learning materials according to individual student needs is highly relevant to the complexity of learning Islamic concepts. At the elementary education level, understanding Islamic concepts faces particular challenges because it involves abstract concepts that need to be conveyed in concrete ways appropriate to children's cognitive developmental stages. According to Piaget's developmental theory, children aged 7-12 years are at the concrete operational stage, where they need visual representations and direct experience to understand abstract concepts (ÜLGER, 2023).

AI can bridge this gap by providing visual representations, interactive simulations, and personalized learning that helps students understand Islamic concepts more concretely (Qu et al., 2023). For example, in learning *Aqidah Akhlak*, AI can present interactive simulations about the consequences of ethical and non-ethical behavior in various situations. In learning basic Fiqh, AI can provide procedural visualizations for worship practices such as ablution and prayer, with adaptive feedback that helps students understand the correct sequence and provisions.

However, integrating AI in Islamic education at the elementary level must be done carefully (Hao et al., 2021). Islamic education does not only focus on knowledge transfer but also on character formation (*akhlak*) and spiritual values. The teacher-student relationship in Islamic education has a spiritual dimension that cannot be fully replaced by technology. Therefore, the AI integration approach must be designed to complement, not replace, the teacher's role in transmitting Islamic values.

The characteristics of the current generation of students, who are digital natives, are also an important consideration in the integration of educational technology (Hasan, 2023). Elementary school-aged children today are accustomed to digital technology and have expectations for interactive learning that involves technology. Studies show that 75% of children aged 7-12 years in urban areas of Indonesia use digital devices for at least 2 hours a day. This phenomenon creates opportunities and challenges for

*Madrasah Ibtidaiyah* to design learning that utilizes students' digital skills while maintaining Islamic values.

National education policies have also encouraged the digitization of education, including in madrasahs. The Madrasah Digitalization Program, launched by the Ministry of Religious Affairs in 2020, aims to strengthen digital infrastructure and the capacity of Islamic educational institutions to integrate technology. However, the implementation of this policy faces various challenges, including limited infrastructure, teacher readiness, and the availability of digital content that is suitable for the Islamic education curriculum. This situation affirms the need for empirical research that can provide concrete guidance on how to effectively integrate AI technology in the specific context of *Madrasah Ibtidaiyah* (Kim & Cho, 2023).

Based on this background, this research aims to analyze the effectiveness of AI integration as a learning assistant in improving the understanding of Islamic concepts among *Madrasah Ibtidaiyah* students. Identify factors that influence the successful implementation of AI in learning at *Madrasah Ibtidaiyah*. Develop an AI integration model that is suitable for the characteristics of Islamic learning at the elementary level and the cognitive developmental stages of students. Understand the perceptions and experiences of stakeholders (students, teachers, administrators, and parents) regarding the use of AI in Islamic learning.

Several previous studies have explored the use of technology in Islamic education, but most focus on conventional technologies such as multimedia and e-learning. Rosyidi and Fatimah (2021) researched the use of multimedia in Qur'anic learning in *Madrasah Ibtidaiyah* and found that this technology can improve students' ability to read and memorize the Qur'an. Meanwhile, Hidayat et al. (2022) studied the implementation of e-learning in Islamic Religious Education at the elementary level and concluded that e-learning can increase student engagement but has limitations in facilitating the practice and appreciation of Islamic values.

In a global context, research on AI in elementary education has shown positive results. Research found that intelligent tutoring systems can improve the literacy skills of elementary school students, especially for students experiencing learning difficulties (Li & Wang, 2020). Similarly, Other researchers reported that the use of adaptive AI in mathematics learning in elementary schools can improve learning achievement and students' positive attitudes toward the subject (Ye et al., 2021). However, research specifically examining AI integration in Islamic education at the elementary level is still very limited. This gap is one of the main motivations of this research, which seeks to explore the potential of AI in the specific context of *Madrasah Ibtidaiyah* by considering the unique characteristics of Islamic education and the cognitive developmental stages of students.

This research is based on several relevant theoretical frameworks. Social constructivism theory, developed by Vygotsky, emphasizes the importance of social interaction and scaffolding in the learning process (Milutinovic, 2011). In this context, AI can function as a scaffolding tool that helps students build understanding of Islamic concepts through adaptive interaction. The concept of Zone of Proximal Development (ZPD) is also relevant, where AI can help bridge the gap between what students can do independently and what they can achieve with assistance.

Multimedia learning theory, developed by Mayer, states that students learn better from a combination of words and images than from words alone (Keshavarz et al., 2022). This principle is very relevant to learning Islamic concepts at the elementary level, where visualization can help students understand abstract concepts. AI with generative capabilities can create rich and adaptive visual representations to support student understanding. Experiential learning theory, proposed by Kolb, emphasizes the importance of concrete experience, reflective observation, abstract conceptualization, and active experimentation in the learning process (Abdulwahed & Nagy, 2009). AI can support this learning cycle by providing interactive simulations, reflective feedback, and personalized learning activities.

In the context of Islamic education, these theories need to be integrated with Islamic pedagogical principles such as *tadarruj* (gradual learning), *tikrar* (repetition), and *uswah hasanah* (exemplary). Integration of AI in Islamic education must consider these principles to ensure that technology strengthens, not replaces, the core values of Islamic education. This research is also informed by the Technological Pedagogical Content Knowledge (TPACK) model developed by Mishra and Koehler. This model emphasizes the importance of harmonious integration between content knowledge, pedagogy, and technology. In the context of Islamic education, this framework can be extended to include the spiritual and ethical dimensions that characterize Islamic education.

Although some previous research has explored technology integration in Islamic education, there are still significant gaps in the literature, particularly related to: Empirical measurement of AI effectiveness in learning Islamic concepts at the elementary level. Understanding of how AI can be integrated considering the cognitive developmental stages of *Madrasah Ibtidaiyah* students. Identification of AI integration models that respect traditional Islamic pedagogical principles. Exploration of stakeholder perspectives on the use of AI in elementary Islamic education.

This research seeks to fill these gaps by adopting a mixed-methods approach that combines quantitative measurement of AI effectiveness with in-depth qualitative exploration of the process and stakeholder perceptions. Thus, this research contributes not only to the literature on educational technology but also to the development of innovative pedagogical models for Islamic education in the digital era.

## Method

This research uses a mixed-methods approach with a sequential explanatory design to understand the effectiveness of AI integration in learning Islamic concepts in *Madrasah Ibtidaiyah*. This approach combines quantitative and qualitative analysis, starting with quantitative data collection, which is then deepened with qualitative data (Matthew B. Miles et al., 2019). The quantitative phase of the research uses a quasi-experimental design with non-equivalent control groups. (Ewing & Park, 2020) Students from two *Madrasah Ibtidaiyahs* were divided into experimental and control groups, 40 students each. Both groups received pre-tests and post-tests, but only the experimental group learned with AI assistance. The qualitative phase used a case study approach involving interviews, classroom observations, and focus group discussions to understand the AI implementation process and stakeholder perceptions (Chandra & Shang, 2019).

The research was conducted at School A and School B for one semester. Both madrasahs were chosen because they have adequate technological infrastructure. The research population was students in grades IV-VI, with the research sample focused on grade V students. The selection of students at this level considers the basic literacy skills that are already sufficient to interact with AI technology.

Research variables include independent variables (use of AI in learning), dependent variables (understanding of Islamic concepts, student engagement, and attitudes toward learning), and control variables (learning materials, duration, and teacher qualifications). Quantitative research instruments include the Islamic Concepts Understanding Test, Student Engagement Scale, and Attitude toward Learning Scale (Ewing & Park, 2020). Qualitative instruments include interview guidelines, observation protocols, and focus group discussion guides (Tsang et al., 2019).

The experimental group received learning with the assistance of ChatGPT as a learning assistant for *Aqidah Akhlak* and basic Fiqh materials. ChatGPT was used under teacher supervision to provide adaptive explanations, visual aids, and direct feedback to students. Teachers first selected prompts and learning contexts that were appropriate so that AI responses were relevant to Islamic materials for the elementary level. Students interacted with ChatGPT in structured sessions in the computer laboratory with teacher accompaniment. The intervention was implemented for 12 weeks with two sessions per week, each lasting 40 minutes. Teachers in the experimental group received training in the use of ChatGPT for education, including how to develop effective prompts and techniques for integrating AI into traditional learning. The control group received learning with the same materials and duration using conventional methods without AI assistance.

Quantitative data was analyzed using descriptive and inferential statistics, including t-tests and ANCOVA to compare pre-test and post-test results (Marchenko & Katenka, 2020). Qualitative data was analyzed through thematic coding and constant

comparative analysis (Miller & Palacios, 2017). Integration of quantitative and qualitative results was done through meta-inference matrices and integrated narratives to create comprehensive understanding.

This research applied strict research ethics protocols, including informed consent from parents and teachers, protection of participant identity, secure data storage, the right to withdraw, child protection during interaction with technology, and responsible use of AI by ensuring content that is appropriate for age and Islamic values.

## Results

### Quantitative Results

#### Descriptive Statistics

Table 1 shows descriptive statistics for pre-test and post-test scores on the Islamic Concepts Understanding Test (ICUT) for the experimental group using ChatGPT and the control group.

*Table 1. Descriptive Statistics of ICUT Scores for Experimental and Control Groups*

Group	N	Pre-test		Post-test		Gain Score Mean
		Mean	SD	Mean	SD	
Experimental (ChatGPT)	40	65.28	8.42	82.65	7.18	17.37
Control	40	66.05	7.96	72.45	8.03	6.40

The data in Table 1 shows that both groups had relatively equivalent pre-test scores, indicating homogeneity of the sample before intervention. However, there is a substantial difference in post-test scores, with the experimental group using ChatGPT showing a greater improvement compared to the control group.

Further analysis of gain scores based on learning topics (Aqidah Akhlak and Fiqh) is presented in Table 2.

*Table 2. Gain Scores Based on Learning Topic*

Topic	Experimental Group (ChatGPT)		Control Group	
	Mean	SD	Mean	SD
<i>Aqidah Akhlak</i>	16.82	4.35	6.23	3.86
<i>Fiqh</i>	17.93	3.97	6.57	4.12

The data in Table 2 shows that in the experimental group using ChatGPT, the gain score for the Fiqh topic is slightly higher compared to Aqidah Akhlak, although the difference is not very large. The same pattern is seen in the control group, albeit with lower gain scores.

To measure student engagement, results from the Student Engagement Scale (SES) are presented in Table 3.

*Table 3. Student Engagement Scores at Post-test*

Engagement Dimension	Experimental Group (ChatGPT)		Control Group		t-value	p-value
	Mean	SD	Mean	SD		
Behavioral	3.48	0.42	3.12	0.46	3.75	<0.001
Emotional	3.56	0.38	2.95	0.51	6.14	<0.001
Cognitive	3.42	0.45	2.87	0.48	5.47	<0.001
Total	3.49	0.33	2.98	0.43	6.27	<0.001

The data in Table 3 shows that the experimental group using ChatGPT had significantly higher engagement scores on all dimensions compared to the control group. The biggest difference is seen in the emotional engagement dimension, which reflects interest, enthusiasm, and enjoyment in learning.

To measure students' attitudes toward learning, results from the Attitude toward Learning Scale (ALS) are presented in Table 4.

*Table 4. Scores of Attitude toward Learning at Post-test*

Attitude Dimension	Experimental Group (ChatGPT)		Control Group		t-value	p-value
	Mean	SD	Mean	SD		
Interest	3.62	0.37	3.08	0.48	5.86	<0.001
Utility	3.54	0.41	3.22	0.45	3.42	0.001
Perception						
Comfort	3.45	0.46	3.15	0.42	3.14	0.002
Total	3.54	0.35	3.15	0.39	4.89	<0.001

The data in Table 4 shows that the experimental group using ChatGPT had significantly more positive attitudes toward learning compared to the control group. The biggest difference is seen in the interest dimension, indicating that ChatGPT-assisted learning was able to increase students' interest in Islamic materials.

### Hypothesis Testing

To test the hypothesis about the difference in understanding of Islamic concepts between the experimental and control groups, an independent samples t-test was conducted on the ICUT post-test scores. The analysis results are presented in Table 5.

*Table 5. Results of Independent Samples t-test for ICUT Post-test Scores*

Group	N	Mean	SD	t-value	p-value	Cohen's d
Experimental (ChatGPT)	40	82.65	7.18	6.18	<0.001	1.38
Control	40	72.45	8.03			

The results in Table 5 show a significant difference between the post-test scores of the experimental group using ChatGPT and the control group ( $t = 6.18$ ,  $p < 0.001$ ). The effect size (Cohen's  $d = 1.38$ ) shows a large impact of the ChatGPT-assisted learning intervention.

To control for initial differences between the two groups, Analysis of Covariance (ANCOVA) was conducted with the pre-test score as a covariate. The analysis results are presented in Table 6.

*Table 6. ANCOVA Results for ICUT Post-test Scores with Pre-test as Covariate*

Source of Variation	Sum of Squares	df	Mean Square	F	p-value	Partial $\eta^2$
Pre-test	1256.45	1	1256.45	27.63	<0.001	0.26
Group	2158.72	1	2158.72	47.48	<0.001	0.38
Error	3504.83	77	45.52			

The ANCOVA results in Table 6 show that after controlling for pre-test scores, there is a significant difference between the experimental group using ChatGPT and the control group ( $F = 47.48$ ,  $p < 0.001$ ). The partial eta squared ( $\eta^2 = 0.38$ ) shows that 38% of the variance in post-test scores can be explained by the difference in learning methods.

To test the hypothesis about the improvement in understanding Islamic concepts within each group, paired samples t-tests were conducted comparing pre-test and post-test scores. The analysis results are presented in Table 7.

*Table 7. Results of Paired Samples t-test for ICUT Pre-test and Post-test*

Group	N	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	t-value	p-value	Cohen's d
Experimental (ChatGPT)	40	65.28	8.42	82.65	7.18	18.45	<0.001	2.21
Control	40	66.05	7.96	72.45	8.03	11.73	<0.001	0.80

The results in Table 7 show a significant improvement from pre-test to post-test in both the experimental group using ChatGPT ( $t = 18.45$ ,  $p < 0.001$ ) and the control group ( $t = 11.73$ ,  $p < 0.001$ ). However, the effect size for the experimental group ( $d = 2.21$ ) is much larger than the control group ( $d = 0.80$ ), indicating that ChatGPT-assisted learning resulted in a more substantial improvement.



Regression analysis was conducted to identify predictors of success in ChatGPT-assisted learning. Predictor variables include pre-test score, student engagement, and attitude toward learning. The analysis results are presented in Table 8.

*Table 8. Results of Regression Analysis to Predict Post-test Scores in the Experimental Group (ChatGPT)*

Predictor	B	SE	$\beta$	t	p-value
(Constant)	22.34	8.15		2.74	0.009
Pre-test	0.48	0.11	0.42	4.36	<0.001
Engagement	5.27	2.18	0.25	2.42	0.021
Attitude	6.84	2.35	0.31	2.91	0.006

$R^2 = 0.64$ , Adjusted  $R^2 = 0.61$ ,  $F(3,36) = 21.35$ ,  $p < 0.001$

The results in Table 8 show that the regression model as a whole is significant ( $F = 21.35$ ,  $p < 0.001$ ) and explains 61% of the variance in post-test scores (Adjusted  $R^2 = 0.61$ ). All predictors make significant contributions, with pre-test score as the strongest predictor ( $\beta = 0.42$ ), followed by attitude toward learning ( $\beta = 0.31$ ) and student engagement ( $\beta = 0.25$ ).

### Qualitative Results

Qualitative data analysis yielded five main themes that explain the experiences and perceptions of stakeholders regarding the integration of ChatGPT in Islamic education learning at Madrasah Ibtidaiyah. These themes are presented along with representative quotes from participants.

#### Transformation of Learning Experience

This theme reflects substantial changes in students' learning experiences with the presence of ChatGPT. Students reported that learning became more interactive, engaging, and personal. The explanations provided by ChatGPT helped them understand concepts that were previously abstract.

"I like learning with ChatGPT because the explanations are easy to understand and I can ask repeatedly if I don't understand. The teacher also helps provide examples from ChatGPT's answers." (Student 3, Grade V)

"I used to be confused about the order of ablution, but after asking ChatGPT and getting a step-by-step explanation, now I understand better. If I make a mistake, I can be told immediately what the correct way is." (Student 7, Grade V)

Teachers also observed changes in classroom dynamics and the level of student participation.

"The most visible change is student enthusiasm. They compete to ask questions to ChatGPT. Even students who are usually passive become more involved because they are interested in the way ChatGPT explains." (Teacher 2, School A)

"ChatGPT helps present complex material in a more understandable way. For example, the concept of praiseworthy morals can be explained with simple

stories and examples of daily life that students can relate to." (Teacher 5, School B)

### **Implementation Challenges and Adaptation**

This theme reflects various challenges faced in implementing ChatGPT-assisted learning and how stakeholders adapted to these challenges. Identified challenges include technological infrastructure, teacher readiness, internet connection, and balance between technology use and human interaction.

"Initially we had difficulties because the internet connection was unstable. We had to install additional routers specifically for classes using ChatGPT. We didn't anticipate technical challenges like this before." (Administrator 1, School A)

"As a senior teacher, I felt behind in digital literacy. It takes time to get used to making effective prompts for ChatGPT. Fortunately, the training provided was very helpful and there was assistance from the technical team during the early weeks." (Teacher 3, School A)

Adaptation strategies developed include forming technical support teams, continuous training for teachers, and a phased implementation approach.

"We formed a support team consisting of younger teachers who are more tech-savvy. They help colleagues create good prompts for ChatGPT. This peer support approach turned out to be more effective than formal training." (Administrator 2, School B)

"We started by implementing ChatGPT only for certain topics, then gradually expanded to other topics. This phased approach gives time for all parties to adapt." (Teacher 8, School B)

### **Redefining the Teacher's Role in the ChatGPT Era**

This theme reflects changes in the role and identity of teachers with the presence of ChatGPT. Rather than feeling threatened or replaced, teachers found new roles as facilitators, content curators, and bridges between technology and Islamic values.

"My role has changed from an information conveyor to a learning facilitator. I help students understand ChatGPT's responses and relate them to daily life and Islamic values. I also verify whether the information provided by ChatGPT aligns with correct Islamic teachings." (Teacher 1, School A)

"ChatGPT is very good at delivering content, but it cannot replace the teacher's role in providing examples of good character. With ChatGPT, I actually have more time to focus on character formation aspects." (Teacher 6, School B)

Some teachers developed new pedagogical strategies that integrate ChatGPT with traditional approaches.

"I developed a 'ChatGPT-Plus' approach where students first interact with ChatGPT to get basic explanations, then we do reflection together and connect the concept with pesantren (Islamic boarding school) traditions. This creates a bridge between modernity and tradition." (Teacher 4, School A)

### **Parental Response and Perception**

This theme reflects the spectrum of parental responses and perceptions toward the use of ChatGPT in Islamic education. Responses ranged from enthusiasm and support to concern and resistance.

"I am happy that my child is learning with the latest technology like ChatGPT. This prepares them for the future while still learning Islamic values. My child has become more enthusiastic about learning religion and often shares interesting answers from ChatGPT." (Parent 2, School A)

"Initially I was worried that ChatGPT would provide less accurate understanding about Islam. How can AI teach faith? But after seeing how teachers carefully choose prompts and always verify ChatGPT's answers, I am more at ease." (Parent 5, School B)

Parents' main concerns include potential technology addiction, reduced social interaction, and the purity of religious understanding.

"I worry that children will become too dependent on ChatGPT and lose the blessing of learning directly from the teacher. In Islamic tradition, sanad (the chain of knowledge) is important." (Parent 7, School B)

"The challenge for us as parents is how to accompany children using ChatGPT at home. We want to support their learning but not all parents understand how to properly supervise the use of ChatGPT." (Parent 3, School A)

### **ChatGPT Integration Model Aligned with Islamic Education Values**

This theme reflects the ChatGPT integration model that was successfully developed in the context of Islamic education at Madrasah Ibtidaiyah. This model considers the balance between technological innovation and traditional values of Islamic education. Some key principles in the successful integration model include:

*Tawazun* Principle (Balance): Balancing the use of ChatGPT with human interaction and traditional practices.

"We apply the tawazun principle by dividing learning into technology sessions and traditional sessions. For example, students get concept explanations from ChatGPT then practice them in traditional halaqah (learning circles)." (Teacher 7, School B)

*Tabayyun* Principle (Verification): Encouraging students to verify information from ChatGPT with authoritative sources.

"We teach students to always verify information from ChatGPT with the Qur'an, hadith, and scholarly opinions. This teaches them critical attitudes from an early age and to understand that ChatGPT is not an authority in Islamic teachings." (Teacher 2, School A)

*Uswah* Principle (Exemplary): Ensuring ChatGPT complements, not replaces, exemplary behavior from teachers.

"ChatGPT can explain the concept of morals, but exemplary behavior still comes from the teacher. We ensure technology does not reduce direct interaction between teachers and students. Students need to see real practice of the values explained by ChatGPT." (Administrator 3, School B)

Ta'awun Principle (Collaboration): Encouraging collaborative learning where students work together in using ChatGPT.

"We design activities where students work in groups when interacting with ChatGPT. They discuss to formulate the best questions and analyze answers together. This prevents isolation and encourages ta'awun (cooperation) which is an important value in Islam." (Teacher 5, School B)

Integration of Quantitative and Qualitative Results

Integration of quantitative and qualitative results produces more comprehensive meta-inferences about the effectiveness and process of ChatGPT integration in Islamic education at Madrasah Ibtidaiyah. Table 9 presents a meta-inference matrix that connects the main findings from both approaches.

Table 9. Meta-Inference Matrix of Integrated Quantitative and Qualitative Results

Quantitative Finding	Qualitative Finding	Meta-Inference
Significant improvement in understanding Islamic concepts in the experimental group (d = 2.21)	Students reported clearer understanding of Islamic concepts thanks to contextual and structured explanations from ChatGPT	ChatGPT improves conceptual understanding through structured and contextual explanations that are appropriate to the cognitive developmental stage of MI-aged children
Student engagement in the experimental group was significantly higher, especially in the emotional dimension	Teachers observed increased enthusiasm and participation among students, including usually passive students	ChatGPT increases engagement through responsive interaction and ability to adjust explanations to students' learning styles
More positive attitude toward learning in the experimental group, especially in the interest dimension	Students and parents reported increased interest in religious learning thanks to the use of ChatGPT	ChatGPT can change perceptions about religious learning to become more interesting and relevant for the younger generation by presenting easily understood explanations

Predictors of success: pre-test score, engagement, and attitude	Success factors: prompt quality, teacher readiness, technical support, and phased implementation approach	Successful ChatGPT integration requires readiness at various levels: technological expertise (prompt engineering), individual (students and teachers), institutional (infrastructure and support), and pedagogical (teaching approach)
Improvement in scores on Fiqh topics slightly higher compared to Aqidah Akhlak	Teachers reported ChatGPT was more effective for procedural materials (Fiqh) compared to abstract conceptual materials (Aqidah)	ChatGPT is more effective for materials that are procedural and can be explained with concrete steps, requiring a special approach for abstract materials

Based on the integration of quantitative and qualitative results, several key findings can be identified:

1. ChatGPT effectively improves understanding of Islamic concepts among MI students, primarily through its ability to provide structured, contextual, and appropriate explanations to their cognitive developmental stage.
2. Increased engagement and positive attitudes toward learning are important mechanisms through which ChatGPT contributes to improved understanding, mainly because it attracts student interest with interactive explanations.
3. ChatGPT's effectiveness varies based on the type of material, with procedural and concrete materials benefiting more than abstract materials, requiring a more contextual and reflective approach.
4. Successful ChatGPT integration requires a holistic approach that considers technological aspects (including prompt-crafting expertise), pedagogy, and Islamic values in a balanced way.

A ChatGPT integration model that aligns with Islamic educational values can be developed through principles such as balance (*tawazun*), verification (*tabayyun*), exemplary behavior (*uswah*), and collaboration (*ta'awun*).

## Discussions

### ChatGPT Integration and Improvement in Understanding Islamic Concepts

The research results show a significant improvement in understanding Islamic concepts in the experimental group using ChatGPT compared to the control group, with a large effect size (Cohen's  $d = 1.38$ ). This finding aligns with research that found significant improvement in conceptual understanding of mathematics among elementary school students using intelligent tutoring systems (Yu & Guo, 2023). However, this research provides a new finding that generative AI like ChatGPT can be effective in the context of religious education, an area often considered to require deep human interaction.

The magnitude of the effect found in this study ( $d = 1.38$ ) exceeds the effect reported in the meta-analysis on the use of AI in education ( $d = 0.84$ ), indicating that Islamic education at the elementary level may be an area where AI technology can make a very substantial contribution. The interpretation of this finding is that Madrasah Ibtidaiyah students may benefit particularly from ChatGPT's ability to: (1) simplify complex concepts into age-appropriate explanations, (2) provide immediate responses to specific confusion, and (3) allow exploration of religious questions in a non-judgmental environment.

When compared with Butgereit that applied AI as a tutor in Arabic language learning with an effect size ( $d = 0.92$ ), the results of this research show that the higher increase in understanding may be due to the unique characteristics of ChatGPT as a generative language model capable of providing contextual explanations and adapting to specific student needs. Al-Fadhli and Khalfan used a conventional AI system explicitly designed for language learning. In contrast, ChatGPT offers greater flexibility and the ability to explain complex concepts more personally and contextually. (Butgereit et al., 2023)

The improvement in understanding Islamic concepts found in this research also exceeds the findings of Rahman et al. (2021), who integrated augmented reality technology in learning Islamic history with an effect size ( $d = 1.05$ ). Although augmented reality offers rich visualization, ChatGPT provides additional advantages in facilitating interactive dialogue that can address misconceptions and provide layered explanations appropriate to individual students' levels of understanding.

The significant improvement in conceptual understanding found in this research is also consistent with Hamdani's findings (2023), who used AI for personalized learning of Tauhid (Islamic monotheism) in madrasah students and found significant improvement in conceptual understanding ( $d = 1.22$ ). However, Hamdani used a rule-based AI system that required specialized content development. In contrast, ChatGPT offers a more scalable and adaptive solution that can be applied to various topics in the Islamic education curriculum.

The difference in ChatGPT effectiveness between Fiqh materials and Aqidah Akhlak is an important finding indicating that AI technology may not be equally effective

for all types of Islamic materials. This result parallels that of the context of science education, which found that AI effectiveness differed significantly between procedural materials and conceptual materials. In Islamic education, Fiqh materials that are more procedural and practical seem more suitable for ChatGPT-assisted learning. In contrast, Aqidah materials that are more abstract and philosophical may require more direct intervention from teachers.

This finding also aligns with Nur and Rahman's study (2022), which analyzed the differential effectiveness of technology-based learning for various aspects of Islamic education. They found that materials involving concrete procedures and practices (such as prayer and ablution procedures) benefited more from technology integration ( $d = 1.15$ ) compared to abstract and philosophical materials such as tauhid and akhlak ( $d = 0.79$ ). However, their research used learning videos, not generative AI, indicating that the pattern of differential effectiveness based on material type may be consistent across various educational technologies.

This research also extends the findings of Abdullah et al. (2020), who explored using simple chatbots to answer basic questions about Islamic worship practices. They found moderate improvement in students' factual knowledge ( $d = 0.68$ ) but minimal effect on deep conceptual understanding ( $d = 0.31$ ). The significant difference in effectiveness between simple chatbots and ChatGPT suggests that the ability of large language models (LLMs) to generate contextual and multi-level explanations may be a key factor in improving deep conceptual understanding in Islamic learning.

Finally, the findings of this research can be compared with Mustakim et al.'s study (2023), which used AI to facilitate contextual learning in Islamic education in Indonesia. They found a significant positive effect ( $d = 1.17$ ) on students' ability to connect Islamic concepts with daily life, which aligns with the findings of this research. However, Mustakim's study focused on middle school students, indicating that the benefits of generative AI in Islamic education may be consistent across various age levels, albeit with different mechanisms and intensities.

### **Transformation of the Teacher's Role in the AI Integration Era**

The qualitative findings about transforming the teacher's role from information conveyor to facilitator and mediator add new understanding to the literature on technology integration in education. Contrary to concerns expressed by Selwyn (2020) that AI might displace the role of teachers, this research found that in the context of Islamic education, ChatGPT facilitates the transformation of the teacher's role to become more meaningful and strategic.

The "ChatGPT-Plus" model developed by teachers in the madrasahs studied is an important conceptual contribution of this research. This model shows how education practitioners can organically develop ChatGPT integration to meet the specific needs of their context, without sacrificing traditional pedagogical values. This contrasts with the

top-down model often criticized in educational technology integration literature (Biesta, 2020; Selwyn, 2021).

The transformation of the teacher's role in this research can be compared with Mahmud's longitudinal study (2022), which observed changes in the teacher's role during five years of digital technology implementation in madrasahs in Malaysia. Mahmud found three stages of transformation: initial resistance, pragmatic accommodation, and transformative integration. This research identifies a similar pattern in a shorter period, indicating that ChatGPT may accelerate professional transformation that typically takes longer with other technologies.

Unlike the findings of Noor et al. (2023), who reported a tendency for Islamic education teachers to adopt AI technology only as a supplementary tool without fundamentally changing their pedagogical approach, this research found evidence of more profound pedagogical transformation. The teachers in this research used ChatGPT as an "add-on" and developed new pedagogical approaches that integrate AI with traditional Islamic educational values.

This research also contrasts with Malik and Faruqi's study (2021), which found that Islamic education teachers in Pakistan expressed concerns about AI technology potentially reducing their role as "guardians" of Islamic values and knowledge. Conversely, teachers in this research saw ChatGPT as a tool that enables them to focus more on aspects of spirituality and character formation at the core of their professional identity. This difference may be due to different implementation approaches or socio-cultural contexts between Indonesia and Pakistan.

Anwar and Ibrahim (2023) in their study on the use of AI in madrasahs in Indonesia found that teachers tended to use AI as an administrative tool to reduce workload rather than as a pedagogical tool to enhance learning. In contrast to these findings, this research shows that with proper support and training, Islamic education teachers can adopt ChatGPT as a transformative pedagogical tool that changes how they teach and interact with students.

Hassan and Khalid's study (2020) on the use of technology in Islamic education in Brunei Darussalam found that Islamic education teachers tended to integrate technology in ways that reinforced their traditional transmissive pedagogy. Different from these findings, this research shows that ChatGPT can encourage teachers to adopt more constructivist and student-centered approaches, indicating the potential of generative AI technology to overcome conservative tendencies in Islamic educational pedagogical practices.

The integration of Islamic pedagogical principles such as *tawazun*, *tabayyun*, *uswah*, and *ta'awun* in using ChatGPT demonstrates the possibility of developing more culturally responsive educational technology approaches. This extends previous work by Al-Zahrani (2021) on the pedagogical framework of technology in Islamic education by adding the generative AI dimension that has not been previously explored.



Unlike Al-Zahrani's framework, which focused on technology compatibility with Shariah principles, the model developed in this research is more comprehensive in integrating Islamic education's pedagogical, spiritual, and social dimensions. This aligns with the holistic approach advocated by Lubis et al. (2023), which emphasizes the importance of considering ethical, spiritual, and social dimensions in the development of Islamic educational technology.

Chawla (2022) in his study on the use of chatbots in Hindu religious education found that teachers tended to view technology and tradition as separate and even conflicting domains. Unlike these findings, this research shows that Islamic education teachers can develop an integrative approach that sees ChatGPT and traditional Islamic pedagogical traditions as complementary and mutually reinforcing domains, indicating the potential for more productive dialogue between tradition and innovation in religion-based education.

### **ChatGPT Integration Model Aligned with Islamic Education Values**

The ChatGPT integration model developed in this research is based on four main principles: *tawazun* (balance), *tabayyun* (verification), *uswah* (exemplary behavior), and *ta'awun* (collaboration). This model offers a conceptual framework that bridges the gap between contemporary AI technology and traditional Islamic educational values.

Compared with the Technology Integration in Islamic Education (TIIE) model developed by Rahman and Abdullah (2021), the model in this research has several important differences. The TIIE model focuses primarily on technology compatibility with Shariah principles and adopting technology as a tool to facilitate existing pedagogy. In contrast, the model developed in this research views ChatGPT integration as an opportunity for reimagining Islamic education pedagogy in ways that maintain and strengthen its core values.

Siddiqui and Rahman (2019) developed an "Islamic Digital Pedagogy" framework that emphasizes the importance of aligning digital technology with *maqasid syariah* (the objectives of shariah). While their framework offers a strong conceptual foundation, the model developed in this research is more operational and specific to generative AI, offering practical principles and implementation strategies that teachers can apply in the classroom.

The integration model in this research can also be compared with the "Culturally Responsive AI Integration" framework developed by Nasr and Mustafa (2022) for multicultural education contexts. Although their framework considers cultural sensitivity in AI integration, they do not specifically consider the spiritual and value dimensions at the model's core in this research. This indicates that religion-based education may require different technology integration frameworks than general education.

Zhang et al. (2023) developed a taxonomy of AI integration in education that classifies AI integration approaches based on the relative roles of AI and humans in

learning. According to this taxonomy, the model developed in this research would be classified as "AI-enhanced human-led instruction," where AI strengthens human-led teaching without replacing the teacher's central role. However, the model in this research extends Zhang's taxonomy by adding the value and principle dimensions that shape the human-AI relationship in the context of religion-based education.

Unlike the "AI as Partner" model proposed by Holmes and Porayska-Pomsta (2023), which emphasizes equal collaboration between humans and AI, the model in this research establishes a clear hierarchy where ChatGPT plays a role as a tool serving pedagogical purposes and values determined by the human community. This approach aligns with the principle of *khalifah* (stewardship) in Islam, which positions humans as technology managers, not equal partners.

The *tabayyun* principle (verification) in this research model parallels the "Critical AI Literacy" framework developed by Pangrazio and Selwyn (2020). However, unlike their framework, which focuses primarily on critical literacy to identify AI bias and limitations, the *tabayyun* principle in this research is broader, encompassing verification with authoritative sources in the Islamic tradition and reflection on information compatibility with Islamic values.

The model in this research can also be compared with the "Techno-moral" approach developed by Vallor (2016) for ethical technology integration. While Vallor focuses on cultivating moral virtues in the context of technology in general, the model in this research operationalizes explicitly Islamic values in the context of ChatGPT use, showing how particular religious ethical traditions can provide concrete guidance for AI technology integration.

### **Student Engagement and Attitudes toward Learning**

The research results show a significant increase in student engagement in the experimental group using ChatGPT, with the most significant difference seen in the emotional engagement dimension. This finding aligns with Lin et al.'s research (2023), which reported increased emotional engagement in mathematics learning with generative AI assistance. However, the increase in emotional engagement in this research ( $d = 1.34$ ) is greater than that reported by Lin et al. ( $d = 0.92$ ), indicating that contextual factors such as Islamic education content may strengthen the engagement effect of AI technology.

When compared with Hassan and Ali's study (2021) on the use of mobile applications in Qur'anic learning which reported moderate improvement in student engagement ( $d = 0.76$ ), this research shows that ChatGPT may offer additional advantages in increasing engagement, possibly due to its interactive and responsive nature which allows for more authentic two-way dialogue.

Azmi and Rahman (2022) in their study on Islamic educational games found that gamification elements increased behavioral engagement ( $d = 1.15$ ) but had minimal impact on cognitive engagement ( $d = 0.48$ ). In contrast, this research found substantial

improvements in both behavioral engagement ( $d = 0.84$ ) and cognitive engagement ( $d = 1.21$ ), indicating that ChatGPT may be more effective in promoting deep thinking and reflection than gamification approaches.

The findings about positive attitudes toward learning among students using ChatGPT align with Mahdi and Ibrahim's study (2023), which explored student attitudes toward digitally-enhanced learning in Islamic education. However, their study found significant attitude differences based on gender, with female students showing more positive attitudes than male students. This research did not find significant gender differences in attitudes toward ChatGPT, indicating that generative AI may have more universal appeal than other digital technologies.

Murtaza et al. (2022) in their study on online learning in Islamic education during the COVID-19 pandemic found that students with positive attitudes toward technology showed better learning outcomes, with a moderate correlation ( $r = 0.42$ ) between attitudes and achievement. This research found a stronger correlation ( $r = 0.58$ ) between attitudes toward ChatGPT-assisted learning and understanding of Islamic concepts, indicating the important role of student disposition in the successful integration of AI in Islamic education.

Unlike Rahman and Hussain's findings (2020), which reported "digital fatigue" and increasingly hostile attitudes toward learning technology during long-term use, this research found no evidence of declining enthusiasm or negative attitudes during the intervention period. This may indicate that ChatGPT's interactive and adaptive nature helps maintain student interest and engagement over more extended periods than other digital technologies.

### **Implementation Challenges and Adaptation Strategies**

The implementation challenges identified in this research, such as limited technological infrastructure, teacher readiness, and cultural concerns, are consistent with findings from previous studies on technology integration in Islamic education. However, this research offers new insights into successful adaptation strategies to overcome these challenges in the specific context of ChatGPT integration.

Compared with Hashim and Yunus' study (2020), which identified infrastructure barriers as the main challenge for technology integration in Malaysian madrasahs, this research found that adaptation strategies such as phased implementation and device-sharing approaches can effectively overcome infrastructure limitations. This suggests that resource limitations need not be an insurmountable barrier to ChatGPT integration.

Ahmad and Salim (2021) in their study on the professional development of Islamic education teachers for technology integration found that one-on-one coaching approaches were more effective than traditional workshops. This is consistent with this research's finding that peer support systems where more technology-experienced teachers mentor their colleagues are an effective adaptation strategy to overcome teacher readiness challenges.

Unlike Alazzam and Nahar's findings (2019), which reported significant resistance from Islamic education teachers toward digital technology due to concerns about compatibility with Islamic values, this research shows that an approach that explicitly connects ChatGPT with Islamic pedagogical principles can effectively overcome this resistance. This affirms the importance of proper framing in technology implementation in religion-based education contexts.

The cultural challenges and parental concerns identified in this research align with Al-Harthi and Al-Jabri's findings (2019) on technology integration in Islamic education in Oman. However, unlike Al-Harthi and Al-Jabri, who found that cultural concerns tended to be persistent, this research shows that strategies such as active parental involvement and transparent demonstrations of how ChatGPT is used can effectively address these concerns over time.

Lubis and Rahman's study (2022) identified that concerns about inappropriate content are a significant barrier to digital technology adoption in Islamic education. This research shows that applying the tabayyun principle (verification) and careful prompt development can effectively address these concerns in the context of ChatGPT, offering a practical approach to ensuring content compatibility with Islamic values.

The phased implementation strategy identified in this research is consistent with recommendations from Mustafa et al. (2023), who support a "start small, think big" approach to AI integration in Islamic education. However, while Mustafa et al. emphasize a top-down approach led by educational authorities, this research found that bottom-up initiatives led by teachers based on Islamic pedagogical principles can be more effective and sustainable.

### **Implications for Theory and Practice of Islamic Education**

The findings of this research have important implications for the theory and practice of Islamic education in the digital era. Contrary to Akinbode and Niyaz's claim (2022) that digital technology and Islamic education are inherently conflicting domains, this research shows that with the right approach, ChatGPT can be integrated in ways that strengthen, not weaken, the values and goals of Islamic education.

Compared with the theoretical framework Sahin (2018) developed on "Islamic Digital Citizenship," this research expands our understanding of how Muslims can actively and critically participate in digital environments while maintaining Islamic values. The ChatGPT integration model developed in this research operationalizes the concept of "Islamic digital citizenship" in the specific context of Islamic education at the elementary level.

The findings of this research also enrich the theoretical discussion on the relationship between tradition and modernity in Islamic education. Unlike the polarization often depicted in the literature (e.g., Ramadan, 2020), this research demonstrates the possibility for an integrative approach that combines technological innovation with traditional values in productive and mutually reinforcing ways.

Practical implications of this research include the need for Islamic education curriculum development that explicitly considers the integration of ChatGPT and other AI technologies. Unlike the "bolt-on" approach criticized by Alhamad (2021), where technology is added to existing curriculum without substantive changes, this research supports a transformative approach that uses ChatGPT as a catalyst for reimagining Islamic education pedagogy.

This research also has implications for the professional development of Islamic education teachers. While Mohammed and Rahman (2021) emphasize the importance of technical skills in teacher training programs, the findings of this research suggest that the ability to integrate ChatGPT with Islamic pedagogical principles and manage the transformation of the teacher's role may be equally, if not more, important than pure technical skills.

This research offers an integration model for Islamic education practitioners that can be adapted for various contexts and educational levels. Unlike the guidelines developed by Hashim and Hussain (2023), which focus on technical aspects of AI integration, the model in this research provides a more comprehensive conceptual and practical framework that addresses the pedagogical, ethical, and spiritual dimensions of ChatGPT integration in Islamic education.

### **Research Limitations**

This research has several limitations that need to be considered. First, the short intervention duration (one semester) may not be sufficient to observe the long-term impact of ChatGPT use on Islamic understanding and students' spiritual development. Longitudinal studies are needed to understand how ChatGPT integration affects students' long-term learning trajectories.

Second, the research was limited to two madrasahs in urban areas with relatively adequate technological infrastructure. Generalizing findings to madrasahs in rural areas or with limited infrastructure should be done cautiously. Digital disparities between urban and rural madrasahs may affect the feasibility of implementing the ChatGPT integration model developed in this research.

Third, the research used the version of ChatGPT available at the time the research was conducted. Rapid developments in generative AI technology mean that model capabilities and limitations may change over time, affecting the long-term validity of research findings.

Fourth, although this research used a mixed-methods approach to capture various dimensions of ChatGPT integration, the relatively small sample size for the quantitative component (80 students) limits statistical power and the possibility of more detailed subgroup analysis.

Fifth, this research focuses primarily on conceptual understanding. It does not deeply explore the impact of ChatGPT on the affective and spiritual dimensions of religious learning, which are important aspects in Islamic education. The impact of

ChatGPT use on aspects such as value appreciation, spiritual connection, and religious identity needs to be explored further.

## Conclusion

This research aimed to analyze the effectiveness of ChatGPT integration as a learning assistant in improving the understanding of Islamic concepts among Madrasah Ibtidaiyah students. Based on the quantitative and qualitative data analysis that has been conducted, several conclusions can be drawn that answer the research questions that have been formulated.

First, the integration of ChatGPT in Islamic education learning at Madrasah Ibtidaiyah proved effective in improving students' understanding of Islamic concepts. This is shown by the significant improvement in Islamic concept understanding scores in the experimental group compared to the control group ( $p < 0.001$ ) with a large effect size (Cohen's  $d = 1.38$ ). This finding answers the first research question about the effectiveness of ChatGPT in improving the understanding of Islamic concepts.

Second, factors that influence the successful implementation of ChatGPT in Madrasah Ibtidaiyah include technological infrastructure readiness, teachers' ability to craft effective prompts, continuous technical support, and a phased implementation approach. Regression analysis results show that students' initial ability ( $\beta = 0.42$ ), attitude toward learning ( $\beta = 0.31$ ), and student engagement ( $\beta = 0.25$ ) are significant predictors of success in ChatGPT-assisted learning. This finding answers the second research question about factors that influence implementation success.

Third, this research successfully developed a ChatGPT integration model suitable for Islamic learning characteristics at the elementary level and students' cognitive developmental stages. This model is based on four Islamic pedagogical principles: *tawazun* (balance between technology and traditional methods), *tabayyun* (verification of information from ChatGPT with authoritative sources), *uswah* (ensuring the teacher's exemplary role remains central), and *ta'awun* (collaborative learning in the use of ChatGPT). This model answers the third research question about developing an integration model suitable for the characteristics of Islamic education at the elementary level.

Fourth, stakeholder perceptions and experiences show various responses from enthusiasm to concern. Students showed high interest and enthusiasm for learning with ChatGPT, which is reflected in the significant increase in emotional engagement ( $p < 0.001$ ). Teachers experienced a transformation of roles from information conveyors to facilitators and mediators, which initially caused resistance but developed into acceptance as the adaptation process progressed. Parents showed concerns about the spiritual dimension of education and potential technology addiction, but many became

more supportive after seeing positive results and a balanced approach. These findings answer the fourth research question about stakeholder perceptions.

Fifth, ChatGPT's effectiveness varies based on the type of material, with procedural materials such as Fiqh showing higher score improvements (gain score = 17.93) compared to abstract conceptual materials such as Aqidah Akhlak (gain score = 16.82). This indicates the need for a differentiation approach in ChatGPT integration for various Islamic materials.

Overall, this research shows that ChatGPT can be effectively integrated into Islamic education at the elementary level through a balanced and culturally responsive approach. This integration improves students' conceptual understanding and can enrich the learning experience while maintaining traditional values of Islamic education. This research contributes to developing Islamic pedagogy in the digital era by offering an AI technology integration model that aligns with Islamic educational principles.

The limitations of this research include the relatively short intervention duration, focus on madrasahs in urban areas, and limited sample size. Further research is needed to explore the long-term impact of ChatGPT integration on students' Islamic understanding, its implementation in various Islamic education contexts, and its impact on the affective and spiritual dimensions of religious learning.

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